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D E C I S I O N
of 20 January 1999

Case Number: T 0533/97 - 3.2.1

Application Number: 90830576.6

Publication Number: 0440002

IPC: B62D 65/00

Language of the proceedings: EN

Title of invention:
Apparatus for welding motor-vehicle bodies

Patentee:
COMAU S.p.A.

Opponents:
Bayerische Motoren Werke Aktiengesellschaft
AUDI AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0533/97 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 20 January 1999

Appellant: (Opponent 01)
Bayerische Motoren Werke
Aktiengesellschaft
80788 München (DE)

Representative:
-

Other party: (Opponent 02)
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Representative:
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Respondent: (Proprietor of the patent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 7 April 1997 concerning maintenance of European patent No. 0 440 002 in amended form.

Composition of the Board:

Chairman: F. A. Gumbel
Members: P. Alting van Geusau
V. Di Cerbo

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 440 002 in respect of European patent application No. 90 830 576.6, filed on 11 December 1990, was published on 7 September 1994.

II. Notices of opposition were filed by the appellant (opponent 01) and other party (opponent 02) on 18 May 1995 and 7 June 1995, respectively. The oppositions were based on the grounds of Article 100(a) EPC. In respect of an alleged lack of inventive step the oppositions were in particular supported by the documents

D1: EP-B-0 136 190

D2: DE-A-3 733 568

D3: DE-C-2 810 822

D7: US-A-4 658 110

III. By a decision posted on 7 April 1997 the Opposition Division maintained the patent in amended form based on claim 1 filed with letter dated 17 November 1995 and claims 2 and 3 as granted.

The Opposition Division was of the opinion that the subject-matter of the amended patent was novel and inventive. When starting from the closest prior art as was represented by D3 any combination with features disclosed in the other cited documents would not result in the claimed device and, as regards the use of welding robots, D1 led the skilled person away from their application in laser spotwelding.

IV. On 15 May 1997 a notice of appeal was lodged against that decision by opponent 01 together with payment of the appeal fee. In its statement of grounds of appeal, filed on 5 August 1997, the appellant additionally relied upon the prior art document

D8: EP-A-0 160 293.

V. In a communication issued in preparation for oral proceedings the Board expressed the provisional opinion that it should be discussed during the oral proceedings whether the preamble of claim 1 upheld by the Opposition Division was satisfactorily related to the prior art disclosed in D3. Further issues to be discussed during the oral proceedings should include: The possible reasons why the skilled person would envisage the use of laser beam spotwelders as an improvement to the spot welding equipment known from D3. By what considerations the skilled person was led to separate the clamping and welding functions normally combined in a spotwelder. Why the skilled person would use the locating devices themselves as spot welder clamping means thereby allowing a laser welding robot to cooperate with the holes of several of such locating devices.

VI. Oral proceedings were held on 20 January 1999.

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

In the oral proceedings also the opponent 02 took part, although he had not lodged an appeal against the decision of the first instance. It presented an identical request as the appellant.

During the oral proceedings the respondent filed new claims 1 to 3, together with an adapted description, and requested that the patent be maintained on the basis of these new documents and the drawings as granted.

The amended claim 1 reads as follows:

"1. Apparatus for welding motor-vehicle bodies which have been assembled loosely beforehand, comprising:

a station (1) for welding the bodies (B),

a conveyor line (2) for transporting the loosely preassembled bodies (B) to the welding station (1),

a plurality of locating devices (L) arranged at the welding station (1) for clamping the component parts of the body (B) in the correct positions for welding, and

welding means provided at the welding station (1) for welding the component parts of the body (B) together after they have been clamped by the locating devices (L), said welding means including one or more welding robots separately mounted from the said locating devices,

in which the locating devices (L) are supported by at least two pairs of locating frames (4, 5) movable along a predetermined path so as to be interchangeable rapidly at the working position according to the type of body located at the welding station to be welded, the locating devices (L) of each pair of locating frames (4, 5) being suitable for a respective body type, at least some of the locating devices (L) each have an element (13) for engaging the body,

characterised in that each welding robot has a laser focussing head (7, 11) which is separately mounted from said locating devices (L), each engaging element (13) having a through hole (18) for allowing the passage of a laser beam output by a welding robot and the focussing of the beam on the body to be welded,

wherein at least one of said laser-welding robots is programmed so as to cooperate with the hole (18) of several locating devices (L) in order to weld the body (B) in correspondence with those devices."

VII. In support of its request the appellant essentially relied upon the following submissions:

When trying to improve the prior art welding arrangement disclosed in D3 the skilled person already knew from D8 that laser spot welding was technically superior over resistance spot welding. It would therefore be an obvious measure to replace the known resistance spot welding robot used in D3 by the laser spotwelding robots known from D8. In D8 the laser welding beam was directed through a hole in the clamping means that themselves were attached to the robot arm. In order to further improve such an arrangement the skilled person would look for simplification and a reduction of weight so as to enhance positioning accuracy and welding speed, which also allowed the use of a constructionally less heavy robot. Such objects were addressed in D2, another document relating to laser welding and which showed that the clamping means on the robot could be dispensed with. When applying the teaching from D2 but taking account of the fact that for laser spot welding the laser beam should be directed through a hole in the clamping means, which was shown in addition to D8 also in D1, it would be immediately apparent to the skilled person that the workpiece clamping means should be provided with holes for allowing the laser beam to pass. Therefore, when applying these teachings of the prior art the skilled person would be led to separate the welding an clamping functions and arrive without any inventive activity at the arrangement in accordance with the amended claim 1 of the patent in suit.

VIII. The other party relied during the oral proceedings particularly on the following argumentation:

When starting from the welding arrangement known from D3, the disclosure of D1 gave the skilled person all the necessary information for adaptation of such a known spot welding arrangement to include laser spot welding robots without their own clamping means. In particular, D1 showed the use of a laser spot welding robot for welding car bodies and also addressed the advantages achieved with laser spot welding when compared to resistance spot welding so that a combination of the subject-matters of D1 and D3 was obvious. D1 included clamping means which were independent from the laser beam generating means and incorporated through-holes for the passage of the laser beam output. When transferring these teachings to the welding robots known from D3 the skilled person would immediately arrive at the welding arrangement of the amended claim 1.

IX. The respondent disputed the appellant's and other party's view and its arguments may be summarised as follows:

Although D8 showed laser spot welding for vehicle parts it did not disclose or hint at omitting the clamping from the robot arm because the clamping means and their location were essential for the proper functioning of this known spot welder.

D2, further relied upon by the appellant, related to seam welding and in fact a two-step welding method was disclosed, namely a first stage for seam welding between clamping means and, after removal of the

clamping means, a second stage for closing the seam. Because of the different welding technique applied in D2 a combination with spot welder robots such as known from D3 or D8 was not suggested.

Document D1 concerned laser spot welding of car bodies but this known apparatus recommended a fully different solution and even referred to the use of separate robots as disadvantageous. In any case also D1 did not disclose laser focussing heads that were separately mounted from the locating and clamping devices and therefore, objectively seen, the skilled person could not be led by D1 to separate the clamping and welding functions and would not, therefore, arrive at the apparatus claimed in the present patent.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

2.1 Claim 1 of the respondent's request is based on the granted claim 1 which was identical with the originally filed claim 1. The features concerning the welding means including one or more welding robots and at least some of the locating devices having an element for engaging the body, were transferred from the characterising part of the originally filed claim 1 to the precharacterising part of the present claim 1.

Further it was added to the precharacterising part the feature that

- the welding robots are separately mounted from said locating devices,

and to the characterising part the features that

- each welding robot has a laser focussing head which is separately mounted from said locating devices and that

- at least one of the laser-welding robots is programmed so as to cooperate with the hole of several locating devices.

This additional subject-matter follows immediately from the embodiments of the welding apparatus disclosed in the originally filed description (see page 2, second and third paragraph, page 5, first and second paragraph).

Claims 2 and 3 correspond to the originally filed claims 2 and 3.

In view of these assessments no objections under Article 123(2) or (3) EPC arise against the present set of claims.

2.2 The description was adapted to take account of the amendment of claim 1 and does also not give rise to objections under the EPC either.

3. *Novelty*

3.1 Novelty of the subject-matter of the amended claim 1 follows from the fact that the available prior art does not disclose a welding apparatus according to the preamble of claim 1 with a robot having a laser focussing head that is separately mounted from the workpiece locating/clamping means and which robot is programmed to cooperate with through holes of several locating/clamping devices for spot-welding the workpiece (car body).

2.2 Novelty of the subject-matter claimed has in fact not been in dispute.

4. *Inventive step*

4.1 The Board and the parties are in agreement that D3 discloses the closest prior art forming the starting point for the invention. The amended claim 1 was drafted on the basis of this prior art to acknowledge the combination of features known from D3 in its precharacterising part.

4.2 The technical problem to be solved by the subject-matter of the patent in suit can be seen in an improvement of the welding apparatus known from D3 to avoid some of the disadvantages encountered with resistance spot welding.

In view of the available knowledge in respect of the technical properties of laser spot-welding when compared to resistance spot welding equipment (see D8, page 1, line 7 to page 2, line 18), the latter having drawbacks in respect of wear of the electrodes and leads to relatively heavy welding equipment giving rise to mechanical drag and resistance of the robot when

performing its programmed moves, a step towards improvement would therefore be seen by the skilled person in a conversion from resistance spot welding to laser spot welding. Therefore, in the Board's opinion, a combination of the teachings of D3 and D8 resulting in the replacement of the resistance spot-welding robots by laser spot-welding robots would be one possible consideration to be taken into account by the skilled person when looking for a solution to the stated problem.

However, such a combination of the teachings of D3 and D8 does not lead to the apparatus claimed in the amended claim 1 of the patent in suit and in particular not to the additional function of the locating devices as clamping means with through holes for effecting laser spot welding through these holes.

4.3 The appellant considered that, having regard to the disclosures of D2, it was obvious to the skilled person to further improve the laser spot welding robot known from D8 to dispense with the clamping means on the focussing head and instead provide the workpiece locating/clamping means with through holes for cooperation with the laser welding robot.

In this respect it is to be noted that D8 discloses an alternative spotwelding arrangement (Figures 2A and 3A) in which a workpiece - having sufficient stiffness - functions as its own "anvil" and instead of clamping the focussing head to the workpiece the head is merely pressed against the workpiece (see page 8, lines 31 to 37). Therefore D8 already discloses that the clamping means can be omitted on the laser-focussing head but without any consideration being given to the location means of the parts to be welded.

The same essentially applies to D2. This known laser welding equipment relates to seam welding with locating/clamping means that are independent from the laser-focussing head but which do not have a particular function in connection with the laser beam itself. Rather these locating/clamping means serve as clamping aids only and in case the area of the clamping means needs to be welded the clamps are taken away. Therefore the Board fails to see why the skilled person could be led by D2 to adapt the locating means known from D3 in the manner as claimed to serve as clamping means with through holes in a spot welding routine.

Attention can also be drawn to the passage in column 5, lines 2 to 19 of D2, which suggests the replacement of spot welding by seam welding because of the higher welding speed achieved and the possibility of the use of less heavier robots that are otherwise needed for spot welding. The appellant's interpretation of this disclosure in the direction of a suggestion to use lighter robots for spotwelding and, as a mere consequence, adaptation of the locating/clamping means in D3 or D8 to have through holes for the passing of the laser beam is therefore considered to be based on hindsight.

4.4 Document D1, also relied upon by the appellant in the written procedure and forming the basis of the other party's argumentation for lack of inventive step of the subject-matter claimed when combined with the welding apparatus known from D3, discloses a laser spotwelding arrangement in which locating/clamping devices are provided with through holes for passing of the laser beam, in accordance with some of the characterising features of the amended claim 1.

The other party was of the opinion that the term robot should be interpreted broadly to include the welding arrangement disclosed in D1. In any case the laser welding arrangement disclosed in D1 provided the skilled person with sufficient information to adapt the welding robot and locating devices known from D3 to arrive in an obvious manner at the laser spot welding arrangement in accordance with the amended claim 1 of the patent in suit.

4.5 It is to be noted that in D1 the laser beam generating means, the laser beam transmitting means, the laser focussing means and workpiece locating/clamping means, which are adapted to the form of the parts to be welded (see column 2, lines 7 to 11), are combined in one automatic welding machine so as to avoid drawbacks resulting from the use of robots (see D1, column 1, lines 37 to 56). Therefore the disclosure of D1 does not lead the skilled person to consider the laser welding arrangement of D1 as a robot.

Furthermore, since the solution proposed in D1 is related to one complete automatic laser welding machine it is quite different from that disclosed in D3 which includes one or more welding robots, exactly that arrangement that is criticised in D1. Therefore, the skilled person is taught away by this prior art from using a welding apparatus forming the starting point of the present invention and there was no suggestion of incorporating single features of this known machine in the robot spot welding arrangement known from D3.

4.6 The appellant and other party were of the opinion that the mirror 26 in the arrangement shown in Figure 6 of D1 was a focussing head separately mounted from the locating devices, and therefore suggesting the separation of welding and clamping in laser spot welding.

However, it follows from the disclosure of D1 that the mirror 26 is no focussing means but a swingable mirror for reflecting and directing the laser beam to the different welding heads 13, each welding head comprising a focussing lens 13_3. The welding heads 13 are mounted to a common frame 10 to which also the locating/clamping means are attached.

Therefore D1 does not show or suggest the provision of a laser focussing head which is separate from the locating/clamping devices and which is movable to cooperate with the hole of several of such locating/clamping devices. Consequently also for this reason D1 cannot give a hint at a separation of the location/clamping means from a laser spot welding robot known from D8.

4.7 In the Board's opinion there is no need to discuss in detail the further documents cited in the opposition proceedings but not specifically relied upon anymore in the appeal proceedings because these other documents clearly do not come closer than the documents relied upon in the opposition or appeal proceedings and discussed here above. This also applies to document D7 which is of similar content as D8 but not related to robots and therefore less relevant than D8.

4.8 In summary the Board comes to the conclusion that the subject-matter of claim 1 according to the respondent's request cannot be derived in an obvious manner from the cited prior art and consequently involves an inventive step (Article 56 EPC). Therefore, this claim together with its dependent claims 2 and 3, the amended description and drawings form a suitable basis for maintenance of the patent in amended form.

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 with the following documents:

   Claims 1 to 3 and description as presented during the oral proceedings, drawings as granted.

The Registrar: The Chairman:

S. Fabiani F. Gumbel