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D E C I S I O N
of 4 July 2001

Case Number: T 0936/99 - 3.2.1

Application Number: 93104402.8

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Language of the proceedings: EN

Title of invention:
One-piece knuckle assembly

Patentee:
Mitchell, James

Opponent:
Carl Dan Peddinghaus GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0936/99 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 4 July 2001

Appellant: Mitchell, James
(Proprietor of the patent) 2808 Range Line Circle
Mequon
Wisconsin 53092 (US)

Representative: Rüger, Rudolf, Dr.-Ing.
Patentanwälte Rüger, Barthelt & Abel
Postfach 348
D-73704 Esslingen (DE)

Respondent: Carl Dan Peddinghaus
(Opponent) GmbH & Co. KG
Mittelstr. 64
D-58256 Ennepetal (DE)

Representative: Fücksle, Klaus, Dipl.-Ing.
Hoffmann Eitle
Patent- und Rechtsanwälte
Arabella strasse 4
D-81925 München (DE)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 3 August 1999
revoking European patent No. 0 615 893 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: F. A. Gumbel
Members: S. Crane
J. H. Van Moer

Summary of Facts and Submissions

- I. European patent No. 0 615 893 was granted on 27 November 1996 on the basis of European patent application No. 93 104 402.8.
- II. The granted patent was opposed by the present respondents on the grounds, in particular, that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC). The main state of the art relied upon in this respect comprised the pre-published documents
- (D5) VDI-Z., Bd. 123(1981), pages 148-157,
"Schmiedgerechte Konstruktion - Ein Weg Zum
Leichtbau",
- (D6) JP-A-60 138049 (with English language abstract).
- as well as the alleged public prior use of the steering knuckle shown in various works drawings of the respondents designated documents D2, D3 and D8 in the list on page 3 of the contested decision.
- II. With its decision posted on 3 August 1999 the Opposition Division revoked the patent. It was held that the allegedly prior used steering knuckle belonged to the state of the art but did not anticipate the subject-matter of granted claim 1. This subject-matter was however obvious in the light of the teachings of document D5 and the common general knowledge of the person skilled in the art.
- IV. A notice of appeal against this decision was filed on 22 September 1999 and the fee for appeal paid at the

same time. The statement of grounds of appeal was filed on 3 December 1999.

V. In a communication pursuant to Article 11(2) RPBA posted on 20 November 2000 the Board questioned the extent to which the features relied upon by the appellant (proprietor of the patent) for justifying an inventive step were actually reflected in the terms of granted claim 1. As for the allegedly prior used steering knuckle the Board indicated that it shared the view of the Opposition Division that this belonged to the state of the art. However, it was not of the opinion that the steering knuckle involved was more relevant to the question of inventive step than was document D5.

VI. Oral proceedings were held on 4 July 2001.

At the oral proceedings the appellant submitted a new set of claims 1 to 7 and requested maintenance of the patent in amended form on the basis of these together with the description and drawings as granted (main request) or in the alternative on the basis of a new claim 1 combining the features of claims 1 and 4 (auxiliary request).

Claim 1 according to the main request reads as follows:

1. A one-piece steering knuckle assembly (10,110, 210,310) for heavy commercial vehicles having a gross vehicle weight of at least 6350 kg (14,000 lbs.) comprising:

a flanged body (11,111,211,311) constructed and arranged to receive a brake assembly, said

flanged body (11,111,211,311) having first and second generally planar sides;
a wheel spindle (12,112,212,312) extending from said flanged body (11,111,211,311) on its first side;
upper and lower enlarged bosses (27,28,127,128,227,228,327,328) extending from said flanged body (11,111,211,311) on its second side opposite said wheel spindle (12,112,212,312), said bosses (27,28,127,128,227,228,327,328) having a bore (24,124,224,324) with said bores (24,124,224,324) being axially aligned to receive a king pin (21); and
a tie rod arm (16,116,216,316) extending from said lower enlarged boss (28,128,228,328) and away from said second side of said flanged body (11,111,211,311) and then bent to be spaced from said flanged body (11,111,211,311) in a generally parallel manner.
said flanged body (11,111,211,311), wheel spindle (12,112,212,312), tie the rod arm (16,116,216,316) and enlarged bosses (27,28,127,128,227,228,327,328) all being formed from a single steel billet as a one-piece duty forging."

Dependent claims 2 to 7 relate to preferred embodiments of the steering knuckle defined in claim 1.

The respondents requested that the appeal be dismissed and revocation of the patent in its entirety confirmed.

VII. The arguments of the appellant in support of his main request can be summarised as follows:

The steering system of a heavy commercial vehicle of the type to which the invention related comprised a steering knuckle on one side of the vehicle provided with both a steering arm and a tie rod arm, whereas the steering knuckle on the other side of the vehicle had only a tie rod arm. The invention resided in the development of a steering knuckle configuration which enabled the version with both steering arm and tie rod arm to be manufactured as a one-piece heavy duty forging. Since, however, its essence lay in the way the tie rod arm was arranged and configured, which was the same for both steering knuckles, irrespective of whether the steering arm was present or not, then it was appropriate not to restrict the main claim in this sense.

The closest state of the art was the steering knuckle visible in Figure 16 of document D5, which was a one-piece forging comprising a tie rod arm extending from the lower enlarged boss in what would appear from the photograph to be a generally straight line generally parallel to the plane of the flange body. The parting line of the forging dies for manufacturing this steering knuckle was arranged transverse to the wheel spindle so that forging of the integral tie rod arm presented no problems in this respect. It would however be technically impossible to incorporate an integral steering arm, extending conventionally from the upper enlarged boss in a direction substantially opposite to that of the wheel spindle, into this configuration. The only example in the prior art of a one-piece steering knuckle having both steering arm and tie rod arm was the one formed by casting as disclosed in document D6, where wholly different manufacturing constraints prevailed. With the steering knuckle as proposed in the

contested patent it was however possible to use forging dies having a parting line extending parallel to the axis of the wheel spindle; the tie rod arm and, if present, the steering arm extended initially in the plane of the parting line; after the main forging step the distal portion of the tie rod arm was bent by die forming to required angular position spaced from and generally parallel to the flange body. There was nothing comparable to this proposal in the state of the art.

VIII. In reply the respondents put forward essentially the following arguments:

It could be seen from document D5 that the parting line of the dies used for forging steering knuckles could extend either transversely or parallel to the axis of the wheel spindle. Both alternatives and the advantages and disadvantages associated with each were well known in the art.

If the person skilled in the art were to opt for a die parting line parallel to the axis of the wheel spindle when manufacturing the steering knuckle shown in Figure 16 then it would be obvious to him that it would be necessary to forge the tie rod arm initially in a direction lying along the parting line and then to bend it so that it took up the required position, as dictated by conventional steering geometry. The resulting steering knuckle would exhibit all of the features defined in claim 1 of the main request, which therefore lacked inventive step.

Reasons for the Decision

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

2. In comparison with the granted patent, claim 1 of the main request contains a more precise definition of the shape and arrangement of the tie rod arm, with it now being required that this arm after first extending away from the second side of the flanged body is then bent to be spaced from this body in a generally parallel manner. A clear basis for this restriction is to be found in the drawings and at column 4, lines 16 to 18 of the original application (published A-document). The complaint of the respondents that the amendment inadmissibly left open how the tie rod arm was bent is not justified since it is apparent from the last feature of the claim that a forging operation must be involved.

3. The technical goal underlying the invention is the provision of a one-piece forged steering knuckle for a heavy commercial vehicle, the steering knuckle comprising in particular a flanged body adapted to receive a brake assembly, a wheel spindle, bosses to receive a king pin, a steering arm and a tie rod arm. Such a steering knuckle is not disclosed in the available prior art. Only document D6 relates to a one-piece steering knuckle having all of the features mentioned, but this known steering knuckle is manufactured by casting rather than by forging.

It must be noted, however, that claim 1 of the main request refers only to the tie rod arm; the steering arm appears first in dependent claim 4. Nevertheless, in the special circumstances of the present case, as

explained by the appellant (see section VII above), the Board agrees that it is appropriate to take the technical goal mentioned above into consideration when evaluating the inventive step of the claimed subject-matter. This is not to say, on the other hand, that that subject-matter is not to be judged solely on the basis of what is defined in the broadest claim, as should normally be the case. In other words, if on the basis of the available prior art it must be seen as obvious to manufacture a steering knuckle as specified in claim 1, that is without a steering arm, as a one-piece forging, then the subject-matter of the claim will lack inventive step, irrespective of any other considerations. But, as explained more fully below, this is not the case.

It is common ground that the closest state of the art is the steering knuckle shown in the photograph of Figure 16 of document D5. As far as can be reasonably determined from the somewhat indistinct photograph and the short relevant passage of description in the right-hand column of page 155, this steering knuckle, which is a one-piece forging, comprises a tie rod arm extending from the lower enlarged boss at an acute angle to the plane of the flanged body. The steering knuckle is forged using dies which have a parting line extending transversely to the axis of the wheel spindle. In view of this and the technical limitations it imposes it can be assumed that the tie rod arm departs essentially from the junction between the lower enlarged boss and the flanged body, of which the flange is of limited extent in this region. The same configuration can be seen in documents D2, D3 and D8 relating to the allegedly prior used steering knuckle. Since this does not come closer to the presently

claimed invention than what can be found in document D5 further investigation of the circumstances surrounding the alleged prior use is unnecessary.

The difference between the configuration of the steering knuckle which is the subject of present claim 1 and that disclosed in Figure 16 of document D5 resides in the shape and arrangement of the tie rod arm. As claimed this first extends away from the lower enlarged boss and is then bent so that it extends spaced from and generally parallel to the flanged body. As already indicated above this particular arrangement is not intended to have any effect on the behaviour of the sheering knuckle as such. The sole reason it has been adopted is one associated with the manufacture of the steering knuckles as one-piece forgings, especially that one of the pair of steering knuckles which will also be equipped with a steering arm. In particular, the claimed arrangement of the tie rod arm allows the steering knuckles to be forged using dies having a parting line which extends in a direction parallel to the axis of the wheel spindle, this, in view of the technical limitations involved, being a prerequisite for arriving at a one-piece forging having steering arm and wheel spindle extending away in opposite directions from the two sides of the flanged body.

The respondents argue that since it is clear from document D5 that the use of dies having a parting line extending parallel to the axis of the wheel spindle was known *per se*, then the person skilled in the art would have been free to adopt this option when making the steering knuckle of Figure 16 and, when doing so, would be obliged to bend the tie rod arm after its initial forging in the way the claimed invention proposes. But

this is a typical case of *ex-post facto* analysis made with hindsight knowledge of the teachings of the patent specification. It is clearly stated in document D5 that having the die parting line extend transversely to the axis of the wheel spindle is the preferred technique and that it is specifically the use of this technique which allowed the one-piece forging including an integral tie rod arm as illustrated in Figure 16 to be realised. Against this background the person skilled in the art, without the knowledge of what it is the invention sets out to achieve, would have had no incentive to move to a two-stage forging/die forming technique for forming the tie rod arm which is inherently more complicated.

In view of the above considerations the Board comes to the conclusion that the subject-matter of claim 1 according to the main request cannot be derived in an obvious manner from the state of the art and therefore involves an inventive step (Article 56 EPC).

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 7 submitted at the oral proceedings;
 - Description and drawings as granted.

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel