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Datasheet for the decision of 25 November 2014

Case Number: T 0155/13 - 3.2.08

Application Number: 06112107.5

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Title of invention:
A torsional vibration damper

Patent Proprietor:
HYUNDAI MOTOR COMPANY

Opponent:
ZF Friedrichshafen AG

Headword:

Relevant legal provisions:
EPC Art. 100(b)

Keyword:
Sufficiency of disclosure

Decisions cited:

Catchword:

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Case Number: T 0155/13 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 25 November 2014

Appellant: (Patent Proprietor)	HYUNDAI MOTOR COMPANY 231, Yangjae-Dong, Seocho-Ku Seoul (KR)
Representative:	Viering, Jentschura & Partner Patent- und Rechtsanwälte Grillparzerstrasse 14 81675 München (DE)
Respondent: (Opponent)	ZF Friedrichshafen AG Graf-von-Soden-Platz 1 88046 Friedrichshafen (DE)
Representative:	Ruttensperger, Bernhard Ruttensperger Lachnit Trossin Gomoll Patent- und Rechtsanwälte PartG mbB 20 16 55 80335 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 16 November 2012 revoking European patent No. 1686285 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	T. Kriner
Members:	M. Alvazzi Delfrate
	D. T. Keeling

Summary of Facts and Submissions

I. By its decision posted on 16 November 2012 the opposition division revoked European patent No. 1 686 285, on the basis of Article 100(b) EPC.

II. The appellant (patent proprietor) lodged an appeal against that decision in the prescribed form and within the prescribed time limit.

III. Oral proceedings before the Board of Appeal were held on 25 November 2014.

IV. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or one of the auxiliary requests 1 to 5, all filed with letter of 1 October 2012.

The respondent requested that the appeal be dismissed or, as an auxiliary request, that the case be remitted to the opposition division for discussion and decision on the questions of novelty and inventive step of the different requests.

V. Claim 1 of the **main request** reads as follows:

"A torsional vibration damper (10; 200) comprising:
a primary mass (11) adapted to be coupled to an engine crankshaft (1) for rotation about a rotational axis (X) of the engine crankshaft (1), the primary mass (11) defining a substantially ring-shaped chamber (25) that is divided into at least two portions;

a secondary mass (13) relatively rotatably connected to the primary mass (11) and connectable with a clutch (3); and
a damping unit (33; 210) for coupling the primary and secondary masses (11, 13) to each other in a rotationally elastic manner,
wherein the damping unit (33; 210) comprises a plurality of elastic members and at least one friction member (43) disposed between the elastic members and which provides a hysteresis effect,
wherein a damping unit (33;210) is disposed in each divided portion of the ring-shaped chamber (25) and wherein the elastic members are coil springs (35, 37, 39, 41),
wherein the coil springs (35, 37, 39, 41) have different mean operating radii,
wherein the respective mean operating radius means a distance between a respective operating center position (S1, S2, S3, S4) and the longitudinal center of the respective coil spring (35, 37, 39, 41), wherein the respective operating center means a center position of a locus of the longitudinal center of the coil spring when the coil springs (35, 37, 39, 41) move within the ring-shaped chamber (25),
wherein the operating centers (S1, S2, S3, S4) are different from each other, and
wherein, because the operating centers and the mean operating radii of the coil springs (35, 37, 39, 41) are different, the coil springs (35, 37, 39, 41) are not compressed at the same time and their compression procedures are different from each other, so the hysteresis effect can be realized."

Claim 1 of **auxiliary request 1** reads as follows (differences in respect of the main request emphasised):

"A torsional vibration damper (10; 200) comprising:
a primary mass (11) adapted to be coupled to an engine crankshaft (1) for rotation about a rotational axis (X) of the engine crankshaft (1), the primary mass (11) defining a substantially ring-shaped chamber (25) that is divided into at least two portions;
a secondary mass (13) relatively rotatably connected to the primary mass (11) and connectable with a clutch (3); and
a damping unit (33; 210) for coupling the primary and secondary masses (11, 13) to each other in a rotationally elastic manner,
wherein the damping unit (33; 210) comprises a plurality of elastic members and at least one friction member (43) disposed between the elastic members, ~~and which provides a hysteresis effect,~~
wherein a damping unit (33;210) is disposed in each divided portion of the ring-shaped chamber (25) and wherein the elastic members are coil springs (35, 37, 39, 41),
wherein the coil springs (35, 37, 39, 41) have different mean operating radii,
wherein the at least one friction member (43) includes an inner wedge (43a) and an outer wedge (43b), and wherein the inner wedge (43a) is urged to move inwardly and the outer wedge (43b)is urged to move outwardly so that the inner wedge (43a) may contact an inner surface of the ring-shaped chamber (25) and the outer wedge (43b) may contact an outer surface of the ring-shaped chamber (25) when the neighboring coil springs(35, 37, 39, 41) are compressed.
~~wherein the respective mean operating radius means a distance between a respective operating center position (S1, S2, S3, S4) and the longitudinal center of the respective coil spring (35, 37, 39, 41), wherein the~~

~~respective operating center means a center position of a locus of the longitudinal center of the coil spring when the coil springs (35, 37, 39, 41) move within the ring-shaped chamber (25),~~
~~wherein the operating centers (S1, S2, S3, S4) are different from each other, and~~
~~wherein, because the operating centers and the mean operating radii of the coil springs (35, 37, 39, 41) are different, the coil springs (35, 37, 39, 41) are not compressed at the same time and their compression procedures are different from each other, so the hysteresis effect can be realized.~~"

Claim 1 of **auxiliary request 2** reads as follows (differences in respect of auxiliary request 1 emphasised):

"A torsional vibration damper (10; 200) comprising:
a primary mass (11) adapted to be coupled to an engine crankshaft (1) for rotation about a rotational axis (X) of the engine crankshaft (1), the primary mass (11) defining a substantially ring-shaped chamber (25) that is divided into at least two portions;
a secondary mass (13) relatively rotatably connected to the primary mass (11) and connectable with a clutch (3); and
a damping unit (33; 210) for coupling the primary and secondary masses (11, 13) to each other in a rotationally elastic manner,
wherein the damping unit (33; 210) comprises a plurality of elastic members and at least one friction member (43) disposed between the elastic members,
wherein a damping unit (33;210) is disposed in each divided portion of the ring-shaped chamber (25) and

wherein the elastic members are coil springs (35, 37, 39, 41),
wherein the coil springs (35, 37, 39, 41) have different mean operating radii,
wherein the at least one friction member (43) includes an inner wedge (43a) and an outer wedge (43b) <u>that are slidably disposed between the neighboring coil springs (35, 37, 39, 41)</u>, and
wherein the inner wedge (43a) is urged to move inwardly and the outer wedge (43b)is urged to move outwardly so that the inner wedge (43a) may contact an inner surface of the ring-shaped chamber (25) and the outer wedge (43b) may contact an outer surface of the ring-shaped chamber (25) when the neighboring coil springs (35, 37, 39, 41) are compressed."

Claim 1 of **auxiliary request 3** reads as follows (differences in respect of auxiliary request 2 emphasised):

"A torsional vibration damper (10; 200) comprising:
a primary mass (11) adapted to be coupled to an engine crankshaft (1) for rotation about a rotational axis (X) of the engine crankshaft (1), the primary mass (11) defining a substantially ring-shaped chamber (25) that is divided into at least two portions;
a secondary mass (13) relatively rotatably connected to the primary mass (11) and connectable with a clutch (3); and
a damping unit (33; 210) for coupling the primary and secondary masses (11, 13) to each other in a rotationally elastic manner,
wherein the damping unit (33; 210) comprises a plurality of elastic members and at least one friction member (43) disposed between the elastic members,

wherein a damping unit (33;210) is disposed in each divided portion of the ring-shaped chamber (25) and wherein the elastic members are coil springs (35, 37, 39, 41),
wherein the coil springs (35, 37, 39, 41) have different mean operating radii,
wherein the at least one friction member (43) includes an inner wedge (43a) and an outer wedge (43b) that are slidably disposed between the neighboring coil springs (35, 37, 39, 41) <u>and elastically supported by the neighboring coil springs (35, 37, 39, 41)</u>, and
wherein the inner wedge (43a) is urged to move inwardly and the outer wedge (43b)is urged to move outwardly so that the inner wedge (43a) may contact an inner surface of the ring-shaped chamber (25) and the outer wedge (43b) may contact an outer surface of the ring-shaped chamber (25) when the neighboring coil springs (35, 37, 39, 41) are compressed."

Claim 1 of **auxiliary request 4** reads as follows (differences in respect of auxiliary request 1 emphasised):

"A torsional vibration damper (10; 200) comprising:
a primary mass (11) adapted to be coupled to an engine crankshaft (1) for rotation about a rotational axis (X) of the engine crankshaft (1), the primary mass (11) defining a substantially ring-shaped chamber (25) that is divided into at least two portions;
a secondary mass (13) relatively rotatably connected to the primary mass (11) and connectable with a clutch (3); and
a damping unit (33; 210) for coupling the primary and secondary masses (11, 13) to each other in a rotationally elastic manner,

wherein the damping unit (33; 210) comprises a plurality of elastic members and at least one friction member (43) disposed between the elastic members,
wherein a damping unit (33;210) is disposed in each divided portion of the ring-shaped chamber (25) and wherein the elastic members are coil springs (35, 37, 39, 41),
wherein the coil springs (35, 37, 39, 41) have different mean operating radii,
wherein the at least one friction member (43) includes an inner wedge (43a) and an outer wedge (43b),
wherein a first slanted contacting surface (73) is formed on one side of the inner wedge (43a),
wherein a second slanted contacting surface (71) is formed on one side of the outer wedge (43b),
wherein the first slanted contacting surface (73) and the second slanted contacting surface (71) contact each other, and
wherein the inner wedge (43a) is urged to move inwardly and the outer wedge (43b)is urged to move outwardly so that the inner wedge (43a) may contact an inner surface of the ring-shaped chamber (25) and the outer wedge (43b) may contact an outer surface of the ring-shaped chamber (25) when the neighboring coil springs(35, 37, 39, 41) are compressed.

Claim 1 of **auxiliary request 5** reads as follows (differences in respect of auxiliary request 4 emphasised):

"A torsional vibration damper (10; 200) comprising:
a primary mass (11) adapted to be coupled to an engine crankshaft (1) for rotation about a rotational axis (X) of the engine crankshaft (1), the primary mass (11)

defining a substantially ring-shaped chamber (25) that is divided into at least two portions;
a secondary mass (13) relatively rotatably connected to the primary mass (11) and connectable with a clutch (3); and
a damping unit (33; 210) for coupling the primary and secondary masses (11, 13) to each other in a rotationally elastic manner,
wherein the damping unit (33; 210) comprises a plurality of elastic members and at least one friction member (43) disposed between the elastic members,
wherein a damping unit (33;210) is disposed in each divided portion of the ring-shaped chamber (25) and wherein the elastic members are coil springs (35, 37, 39, 41),
wherein the coil springs (35, 37, 39, 41) have different mean operating radii,
wherein the at least one friction member (43) includes an inner wedge (43a) and an outer wedge (43b),
wherein a first coil spring receiving hole (67) is formed on one side of an inner wedge (43a) and a first slanted contacting surface (73) is formed on another ~~one~~ side of the inner wedge (43a),
wherein a second coil spring receiving hole (69) is formed on one side of an inner wedge (43a) and a second slanted contacting surface (71) is formed on another ~~one~~ side of the outer wedge (43b),
wherein the first slanted contacting surface (73) and the second slanted contacting surface (71) contact each other, ~~and~~
~~wherein the inner wedge (43a) is urged to move inwardly and the outer wedge (43b)is urged to move outwardly so that the inner wedge (43a) may contact an inner surface of the ring-shaped chamber (25) and the outer wedge (43b) may contact an outer surface of the ring-shaped~~

~~chamber (25) when the neighboring coil springs(35, 37, 39, 41) are compressed~~
so that the outer wedge (43b)is urged to move outwardly and the inner wedge (43a) is urged to move inwardly when the neighboring coil springs(35, 37, 39, 41) are compressed."

VI. The appellant's arguments can be summarised as follows:

As explained in claim 1 of the main request, the mean operating radius meant a distance between a respective operating center position and the longitudinal center of the respective coil spring, wherein the respective operating center meant a center position of a locus of the longitudinal center of the coil spring when the coil springs moved within the ring-shaped chamber, and the operating centers were different from each other.

It was true that the patent in suit did not provide an explicit definition of "operating center position". However, it was clear from Figure 14, which showed operating center positions S1, S2, S3 and S4, that the operating center position was the center position of the trajectory or locus described by the coils in operation by virtue of the action of the wedges, which urged some coils to move outwardly and some others to move inwardly. Even if this trajectory was not circular, at least as long the coil springs did not contact the surfaces of the ring-shaped chamber 25, it was possible to associate a radius and a center to it. This center was the operating center. Accordingly, the person skilled in the art had no difficulty establishing the operating centers and, as a consequence, the mean operating radius of the coils. Hence, the patent disclosed the invention as claimed in the main request in a manner sufficiently clear and complete for it to be carried out by the person skilled in the art.

This was all the more true for the invention as claimed in the auxiliary requests, which stipulated the presence of the wedges in the claimed device, which, as evidenced by paragraph [0131], inevitably resulted in different mean operating radii, as required by the claims.

Accordingly, the revocation of the patent on the basis of Article 100(b) EPC was not justified.

VII. The respondent's arguments can be summarised as follows:

The patent in suit did not define what the operating center position of the coil springs meant. Figure 14 did not provide a clarification in this respect either. It was true that some operating centers were depicted in that drawing. However, no information was given as to how those operating centers were to be determined. In particular there was no hint that they were to be determined on the basis of the trajectory resulting from the effect of the wedges. As a matter of fact that trajectory had no single center in its first non-circular part and a single center for all the coil springs in its last circular part. Hence, the person skilled in the art was not taught how to determine the operating centers by Figure 14. Paragraph [0131] did not provide this teaching either, since it did not establish a causal link between the presence of the wedges and the condition on the operating radii.

Since the person skilled in the art did not know how to determine the operating centers and the operating radii he had no sufficient information to realise the damper claimed in the main request. The same applied to the auxiliary requests, which also stipulated the same condition concerning the operating radii. Accordingly, the revocation of the patent on the basis of Article 100(b) EPC was justified.

Reasons for the Decision

1. The appeal is admissible.

2. Sufficiency of disclosure - Main Request

2.1 Claim 1 of the main request comprises the feature according to which the coil springs "have different mean operating radii".

According to the claim and the description (paragraph [0126]) the respective mean operating radius means a distance between a respective "operating center position" and the longitudinal center of the respective coil spring, wherein the respective operating center means a center position of a locus of the longitudinal center of the coil spring when the coil springs move within the ring-shaped chamber, wherein the operating centers are different from each other.

It is undisputed that neither "mean operating radius" nor "operating center position" are expressions with a generally accepted meaning and that the patent in suit does not provide an explicit definition of "operating center position".

2.2 It is true that Figure 14 indicates the operating center positions S1, S2, S3 and S4 of the coil springs depicted in this drawing. However, neither that drawing nor the corresponding part of the description provides any indication as to how those center positions are to be determined. In particular, there is no indication that the operating center positions shown in Figure 14 are associated with the trajectory described by the coils in operation by virtue of the action of the wedges, which urge some coils to move outwardly and some others to move inwardly. Indeed, although Figure 14 shows a damper exhibiting some wedges between the coils, these coils have undergone no outward or inward movement by virtue of the action of the wedges. Hence, the person skilled in the art does not derive from Figure 14 that the the operating center positions are associated with the movement resulting from the action of the wedges.

Moreover, even if he were to consider this movement, he would have immediately discarded any possibility of associating it with the operating centers and operating radii mentioned in the claim. The action of the wedges urges the coils to move first along a trajectory which, being a combination of an outward and a circular movement, has no single center but continuously varying radius and centers. Hence, the person skilled in the art would have no reason to think that this first movement can be associated with the operating center of the coil spring. Nor would he have a reason to associate this operating center with the second part of the movement of the coils, carried out once they have reached the surfaces of the ring-shaped chamber 25. In this second part the coils move along circular paths that all have the same center, corresponding to the center of symmetry of the damper shown in the drawing, whereas the claim requires that the coil springs have different mean operating radii and operating centers.

Therefore, Figure 14 fails to disclose that the operating centers are associated with the trajectory described as a result of the presence of the wedges.

2.3 Paragraph [0031] does not provide a teaching in this respect either, because it discloses only that by regulating a contacting angle of the inner wedge and the outer wedge <u>and</u> the operating centers and the mean operating radii of the coil springs a desired hysteresis effect can be realized. Accordingly, it fails to disclose a link between the presence of the wedges and the determination of the operating centers.

2.4 Hence, the person skilled in the art is left in the dark as to how to determine the operating centers and, as a consequence, the mean operating radii of the coil springs. Therefore, he is not provided with the information necessary to realise a damper which satisfies the condition concerning the mean operating radii stipulated by claim 1. Accordingly, the patent in suit does not disclose the invention according to claim 1 of the main request in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

3. Sufficiency of disclosure - Auxiliary Requests

The situation for the auxiliary requests does not differ from that of the main request. It is true that the invention as claimed in the auxiliary requests stipulates the presence of the wedges in the damper. However, for the reasons explained above, the patent in suit does not disclose that the operating radii are to be determined on the basis of the effect of those wedges. Accordingly, it does not teach that, as submitted by the appellant, the presence of those wedges inevitably results in different mean operating radii. The person skilled in the art would thus assume that the condition concerning the mean operating radii defined in the claims is a further condition to be satisfied by the claimed damper, in addition to the provision of the wedges. However, as explained above, he would lack sufficient information as to how to realise a damper which satisfies this further condition. Accordingly, the patent in suit does not disclose the invention according to claim 1 of each of auxiliary requests 1 to 5 in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

V. Commare T. Kriner

Decision electronically authenticated