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NL Octrooi Centrum

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06.05.201074 Gemachtigde:
Drs. A. Kupecz c.s. te Amsterdam.54 **Rotary connector for a rotating shank or axle.**

57 Rotary connector for a rotating shank or axle of a machine or similar, comprising at least one sleeve body, with an end region having an opening bounded by a circumferentially closed inner-surface for clampingly accommodating said shank or axle, which opening on its circumferential inner-surface is provided with clamping regions for securing the shank or axle (2) with a press fit; and wherein there is a plurality of spokes (8) that extend radially outwards from said sleeve body, wherein the spokes connect to parts of the sleeve body connecting the clamping regions, and in that at its radially outer end, each spoke connects to a circumferentially provided individual mass, whereby each individual mass only connects to the sleeve body through said spoke and is free from connections with any other spoke.

Rotary connector for a rotating shank or axle

The invention relates to a rotary connector for a rotating shank or axle of a machine or similar, comprising at least one sleeve body, with an end region having an opening bounded by a circumferentially closed inner-surface for clamp-
5 ingly accommodating said shank or axle, which opening on its circumferential inner-surface is provided with clamping regions for securing the shank or axle with a press fit; and wherein there is a plurality of spokes that extend radially outwards from said sleeve body.

10 Such a rotary connector is known from US B 7,217,072.

The known rotary connector is intended for accurate clamping of a rotary tool and allows easy mounting and dismount-
ing of such a rotary tool.

A basic embodiment of the known rotary connector has
15 spokes which at their outwardly directed extremities are connected with an outer circumferential casing. By appropriately pressing on this circumferential casing, the spokes are tensioned so as to release the clamping regions from the rotary tool.

20 US B 7,217,072 acknowledges the problem associated with centrifugal forces that occur during rotational operation of the rotary connector or tool holder. These centrifugal forces try to displace the tension spokes in the radially outward direction, as a result of which the accommodating opening would widen radially. This may result in the risk of the press fit on the
25 shank or axle being weakened due to this centrifugal force, and in the worst-case scenario even being lost. A solution for this problem is taught by US-B-7,217,072 in placing masses at appropriate places in the outer circumferential casing that connects
30 the outwardly extending extremities of the spokes. Thus the centrifugal forces may induce inwardly directed compressive forces to the spokes increasing the press fit when high rotational velocities occur due to the additional masses.

35 It is an object of the invention to provide an alternative to the known rotary connector which may be applied at very high rotational speeds.

The rotary connector of the invention is to that end characterized by one or more of the appended claims.

In a first aspect of the invention the rotary connector has spokes that connect to parts of the sleeve body connecting the clamping regions, and in that at its radially outer end, each spoke connects to a circumferentially provided individual mass, whereby each individual mass only connects to the sleeve body through said spoke and is free from connections with any other spoke.

By this arrangement the benefit is achieved that the parts of the sleeve body connecting the clamping regions act as levers for converting radially outwards directed forces on the spokes to inwardly directed forces exerted by the clamping regions. With the connector of the invention the further benefit is achieved that it is possible to fit the shank or axle in the connectors' body manually. This is due to the possibility to apply only a moderate initial clamping force when the connector is still at a standstill.

Beneficially there are three clamping regions symmetrically provided along the inner-circumference of said opening. This provides the advantage that even without pre-positioning of the shank or axle the three clamping-regions provide clamping-lines that accurately define the position of the shank or axle to be clamped, as opposed to the known construction of US-B-7,217,072 which requires very accurate pre-positioning of the shank of axle due to the nearly circular clamping-line of the connector's inner surface that presses the shank or axle.

Particularly when applying high rotational speeds it is advantageous that the connector is rotationally symmetric with respect to a central body axis through the connector's sleeve body.

The rotary connector as discussed above may be coupled with another (similar) rotary connector through an intermediate elastic coupling. This is an effective means to link two shanks or axels to each other that have to perform the same rotational motion.

In a further aspect of the invention it is possible that the rotary connector has two sleeve bodies each having an end region with an opening for accommodating a shank or axle, which sleeve bodies preferably share a common central body axis and have oppositely directed openings. Advantageously the said two sleeve bodies are integrally formed.

A further beneficial arrangement is that a separating slot is provided at the connector's inner surface at least in part separating the neighbouring clamping regions of said oppositely directed openings. This allows to apply different diameters of the axels or shanks that are to be connected to each other.

The invention will hereinafter be further elucidated with reference to an exemplarily embodiment of the rotary connector of the invention and with reference to the drawing.

In the drawing:

- Fig. 1 shows a cross-section of the rotary connector of the invention;

- Fig. 2 shows an isometric view of the rotary connector of the invention; and

- Fig. 3 shows a cross-section of the rotary connector according to Fig. 1 with an axis of a machine connected thereto.

Whenever in the figures the same reference numerals are applied, these refer to the same parts.

With reference first to Fig. 1 and Fig. 3 the rotary connector 1 of the invention is shown for connecting to a rotating shank or an axel 2 (see Fig. 3) of a machine or other device.

The rotary connector 1 comprises at least one sleeve body 3 with an end region 4 as shown in Fig. 2, that is provided with an opening 5. This opening 5 is bounded by a circumferentially closed inner-surface 6 for clampingly accommodating a shank or axel 2, which schematically is shown in Fig. 3.

The opening 5 is on its circumferentially inner-surface 6 provided with clamping regions 7, which are intended for securing the shank or axel 2 with a press fit, particularly at high rotational speeds of the rotary connector 1 and the axel 2, that is connected thereto.

The figures and in particular figure 1 further show that there is a plurality of spokes 8, that extend radially outwards from the sleeve body 3. These spokes 8 connect to parts 9 of the sleeve body 3, connecting the clamping regions 7 and at the radially outer end of each spoke 8, said spokes 8 connect to circumferentially provided individual masses 10, whereby each individual mass 10 only connects to the sleeve body 3 through the concerning spoke 8 to which it connects, and is free from any connections with any of the other spokes 8.

The construction as just described in detail with reference to Fig. 1 ensures that the parts 9 of the sleeve body 3 connecting the clamping regions 7 act as levers for converting radially outwards directed forces on these spokes 8 to inwardly directed forces exerted by the clamping regions 7. Said levers are in Fig. 1 particularly itemized with reference no. 11.

As Fig. 1, Fig. 2 and Fig. 3 clearly show there are preferably three clamping regions 7 that are symmetrically provided along the inner circumference of said opening 5.

The figures further clearly show that preferably the connector 1 is rotationally symmetric with respect to an imaginary central body axis through the connector's sleeve body 3.

As one can simply imagine when looking at the rotary connector 1 shown in Fig. 2, this connector 1 may have two sleeve bodies 3', 3'' each having an end region 4 with an opening 5 for accommodating a shank or axel. The sleeve bodies 3', 3'' of this rotary connector 1 share a common central body axis and have oppositely directed openings 5. Only one of the openings 5 is visible in Fig. 2.

Fig. 2 further shows that the rotary connector 1 may be provided with a separating slot 12 that is provided in the connector 1 inner surface 6 which serves to at least in part separating the adjacent or neighbouring clamping regions 7 belonging to said oppositely directed openings 5.

CONCLUSIES

1. Draaikoppeling (1) voor een draaiende schacht of as (2) van een machine of dergelijke, omvattende ten minste een hulsvormig lichaam (3), met een eindeel (4) voorzien van een opening (5) begrensd door een in de omtrek gesloten binnenoppervlak (6) voor het klemmend opnemen van genoemde schacht of as (2), welke opening (5) aan haar in de omtrek verlopende binnenoppervlak (6) is voorzien van klemgebieden (7) voor het vastzetten van de schacht of as (2) met een drukpassing, en waarin is voorzien in een meertal spaken (8) die radiaal buitenwaarts vanaf genoemd hulsvormig lichaam (3) verlopen, **met het kenmerk**, dat de spaken (8) met delen (9) van het hulsvormig lichaam (3) verbinden die de klemgebieden (7) koppelen, waarbij aan het radiaal buitenwaarts gelegen uiteinde iedere spaak (8) gekoppeld is met een in de omtrek aangebrachte individuele massa (10), waarbij iedere individuele massa slechts gekoppeld is met het hulsvormig lichaam (3) via genoemde spaak (8) en vrij is van verbindingen met iedere andere spaak.

2. Draaikoppeling volgens conclusie 1, **met het kenmerk**, dat de delen (9) van het hulsvormig lichaam (3) die de klemgebieden (7) verbinden, werken als hefboomen (11) voor het converteren van radiaal buitenwaarts gerichte krachten op de spaken (8) naar inwaarts gerichte krachten, uitgeoefend door de klemgebieden (7).

3. Draaikoppeling volgens conclusie 1 of 2, **met het kenmerk**, dat er drie klemgebieden (7) zijn die symmetrisch voorzien zijn langs het binnenoppervlak van genoemde opening.

4. Draaikoppeling volgens een der conclusies 1-3, **met het kenmerk**, dat de koppeling rotatiesymmetrisch is met betrekking tot een centrale lichaamsas door het hulsvormig lichaam (3) van de koppeling.

5. Draaikoppeling volgens een der voorgaande conclusies, **met het kenmerk**, dat de koppeling (1) twee hulsvormige lichamen (3', 3'') bezit, welke ieder een eindgebied (4) met een opening (5) hebben voor het opnemen van een schacht of as, welke hulsvormige lichamen (3', 3'') een gemeenschappelijke centrale lichaamsas bezitten en tegenover elkaar opgestelde en gerichte openingen bezitten.

6. Draaikoppeling volgens conclusie 5, **met het kenmerk**, dat de twee hulsvormige lichamen (3', 3'') één geheel vormen.

7. Draaikoppeling volgens conclusie 5 of 6, gekenmerkt door een scheidende sleuf (12) die voorzien is aan het binnenoppervlak (6) van de koppeling en welke ten minste ten dele de naastliggende klemgebieden (7) van genoemde tegenover elkaar opgestelde openingen (5) scheiden.

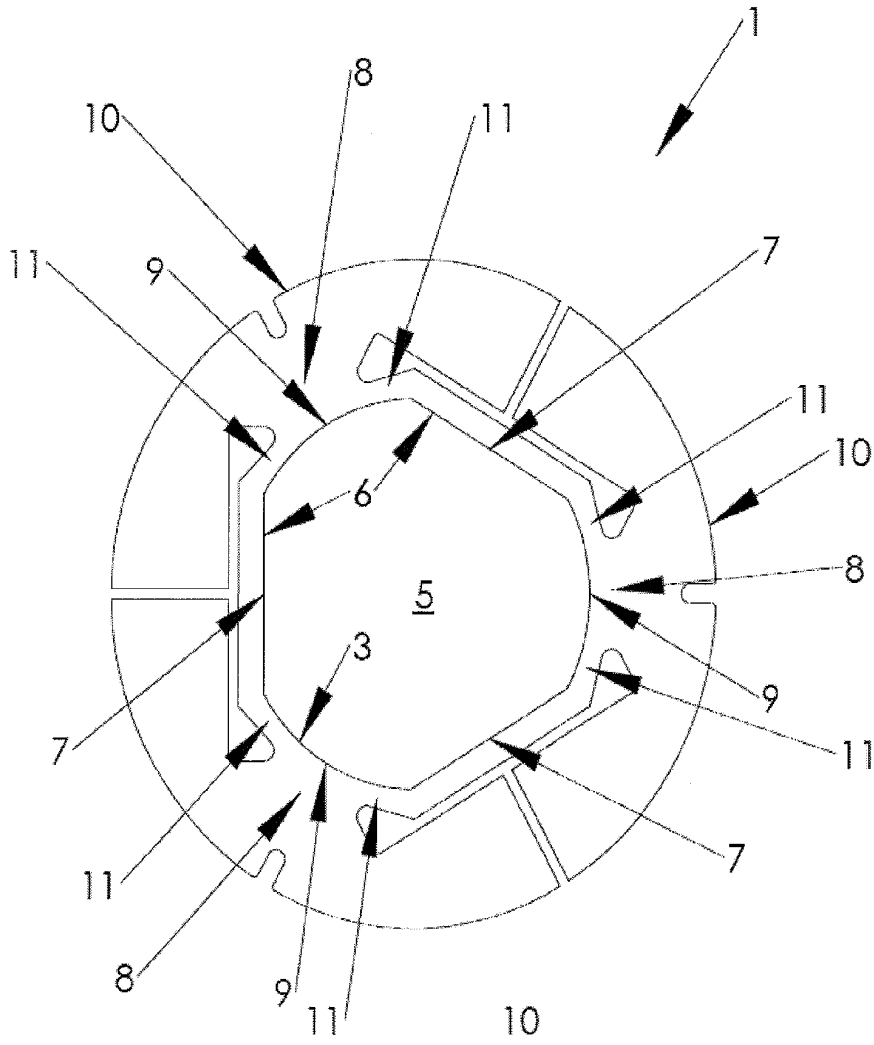


FIG. 1

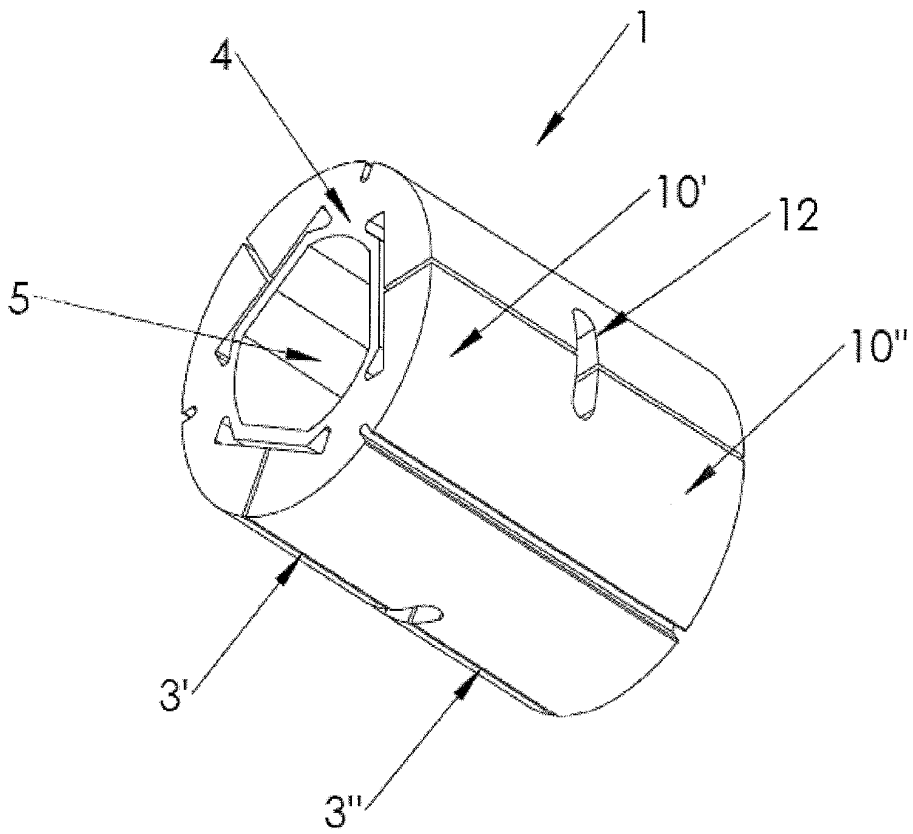


FIG. 2

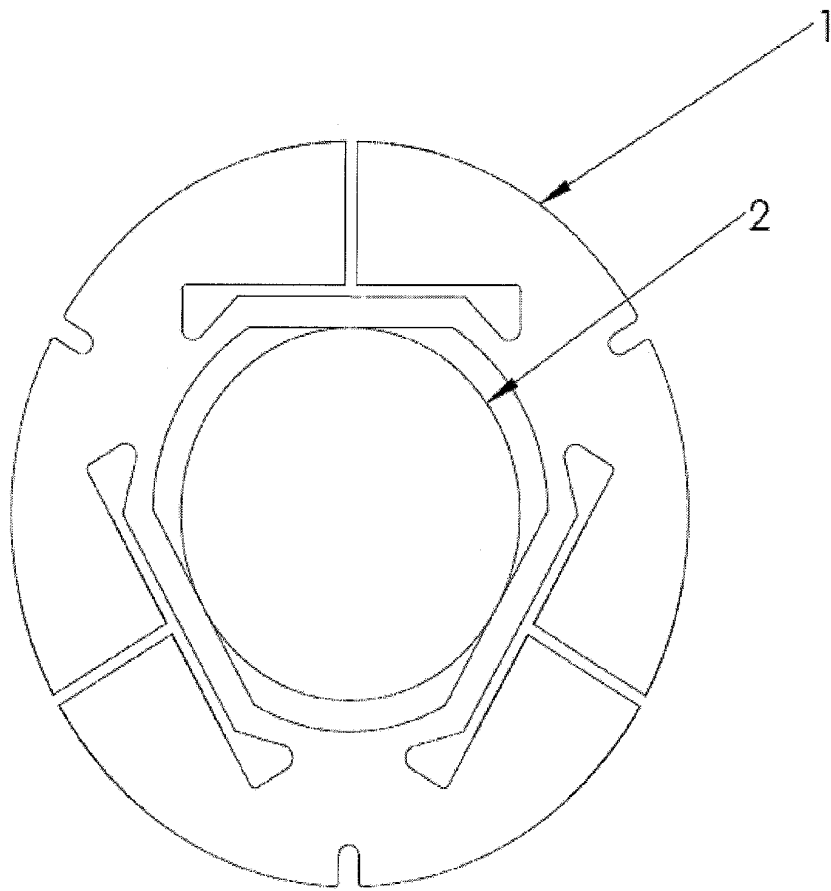


FIG. 3

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE NL 47774-VB/li
Nederlands aanvraag nr. 2002128	Indieningsdatum 23-10-2008
	Ingeroepen voorrangsdatum
Aanvrager (Naam) Technische Universiteit Delft	
Datum van het verzoek voor een onderzoek van internationaal type 03-02-2009	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN 51660
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC) B23B31/20 B23B31/14	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC8	B23B F16D
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III.	<input type="checkbox"/> GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV.	<input type="checkbox"/> GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2002128

A. CLASSIFICATIE VAN HET ONDERWERP
INV. B23B31/20 B23B31/14
ADD. F16D1/08

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
B23B F16D

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 7 217 072 B1 (HAIMER FRANZ [DE]) 15 mei 2007 (2007-05-15) in de aanvraag genoemd het gehele document	1
A	US 2002/152601 A1 (RETBACH THOMAS [DE]) 24 oktober 2002 (2002-10-24) alineas [0030], [0031]; figuren 7,8	1
A	US 2001/050466 A1 (TEMPEST MICHAEL C [GB]) 13 december 2001 (2001-12-13) alineas [0012], [0017]; figuren 1-3	1

Verdere documenten worden vermeld in het vervolg van vak C.

Leden van dezelfde octroofamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

A niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

D in de octrooiaanvraag vermeld

E eerdere octrool(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

L om andere redenen vermelde literatuur

O niet-schriftelijke stand van de techniek

P tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

T na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

X de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

Y de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

Z lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

9 Juni 2009

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

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De bevoegde ambtenaar

Lorence, Xavier

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2002128

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 7217072	B1	15-05-2007	AT 304419 T 15-09-2005
			DE 50011189 D1 20-10-2005
			DK 1301304 T3 05-12-2005
			WO 0205992 A1 24-01-2002
			EP 1301304 A1 16-04-2003
			ES 2248098 T3 16-03-2006
			JP 2004504160 T 12-02-2004

US 2002152601	A1	24-10-2002	GEEN

US 2001050466	A1	13-12-2001	AT 235340 T 15-04-2003
			AU 1990600 A 18-08-2000
			CN 1337894 A 27-02-2002
			DE 60001805 D1 30-04-2003
			DE 60001805 T2 18-12-2003
			EP 1144148 A1 17-10-2001
			WO 0044519 A1 03-08-2000
JP 2002535156 T 22-10-2002			



File No. SN51660	Filing date (<i>day/month/year</i>) 23.10.2008	Priority date (<i>day/month/year</i>)	Application No. NL2002128
International Patent Classification (IPC) INV. B23B31/20 B23B31/14 ADD. F16D1/08			
Applicant Technische Universiteit Delft te Delft			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

Examiner Lorence, Xavier

WRITTEN OPINION

Application number

NL2002128

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	1-7
	No: Claims	
Inventive step	Yes: Claims	1-7
	No: Claims	
Industrial applicability	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

- 1 Reference is made to the following document:
D1: US-B1-7 217 072 (HAIMER FRANZ [DE]) 15 mei 2007 (2007-05-15) in de
aanvraag genoemd
- 2 The document D1 is regarded as being the closest prior art to the subject-matter of claim
1, and shows (the references in parentheses applying to this document):
a rotary connector for a rotating shank (11) or axle of a machine or similar,
comprising at least one sleeve body (7), with an end region having an opening (9)
bounded by a circumferentially closed inner surface for clampingly accommodating said
shank (11) or axle, which opening (9) on its circumferential inner-surface is provided with
clamping regions for securing the shank (11) or axle with a press fit, and wherein there
is a plurality of spokes (13) that extend radially outwards from said sleeve body (7).
- 3 The subject-matter of claim 1 differs from this known rotary connector in that the spokes
connect to parts of the sleeve body connecting the clamping regions, and in that at its
radially outer end, each spoke connects to a circumferentially provided individual mass,
whereby each individual mass only connects to the sleeve body through said spoke and
is free from connections with any other spoke.
The subject-matter of claim 1 is therefore new.
- 4 The problem to be solved by the present invention may be regarded as how to provide
an alternative to the known rotary connector which may be applied at very high rotational
speeds.
- 5 The solution to this problem proposed in claim 1 of the present application is considered
as involving an inventive step for the following reasons:
The combination of the features of claim 1 is neither known from, nor rendered obvious
by, the available prior art.
By this arrangement the benefit is achieved that the parts of the sleeve body connecting
the clamping regions act as levers for connecting radially outwards directed forces on
the spokes to inwardly directed forces exerted by the clamping regions. With the

connector of the invention the further benefit is achieved that it is possible to fit the shank or axle in the connectors' body manually. This is due to the possibility to apply only a moderate initial clamping force when the connector is still at standstill.

- 6 Claims 2-7 are dependent on claim 1 and as such also meet the requirements of novelty and inventive step.