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(73) Octrooihouder(s):
DAF Trucks N.V. te Eindhoven

(72) Uitvinder(s):
Joost Petrus Johannes Vermeeren te Eindhoven
Bert van Nijlen te Eindhoven

(74) Gemachtigde:
ir. H.A. Witmans c.s. te Den Haag

(54) **Bracket and method for clamping an injector onto a cylinder head**

(57) A bracket for clamping an injector onto a cylinder head of an internal combustion engine, comprising a clamp section, arranged for providing a clamping force onto the injector to clamp the injector onto the cylinder head; a mount section, extending from the clamp section and arranged for mounting the bracket to the cylinder head adjacent the injector; and a support section, extending from the mount section opposite the clamp section and arranged for supporting the bracket onto the cylinder head at a lever distance from the clamp section, to define the clamping force; wherein the support section comprises a plurality of support elements, each of said support elements arranged at a different lever distance, such that a selected support element from the plurality of support elements engages, in use, with the cylinder head at a selected lever distance, such that the bracket is supported on the selected support element only, to control a magnitude of the clamping force.

NL B1 2027770

P129482NL00

Title: Bracket and method for clamping an injector onto a cylinder head

Field of the invention

The invention relates to a bracket and method for clamping an injector onto a cylinder head of an internal combustion engine.

Background of the invention

When mounting a fuel injector onto a cylinder head of an internal combustion engine, the injector is clamped by a bracket that is designed to provide a specific clamping force, in accordance with the design characteristics of the engine, in particular the cylinders and cylinder pressures that may occur therein. When mounting the bracket on the cylinder head, the bracket holds the injector positioned and well aligned during operation of the internal combustion engine. Misalignment of the fuel injector with respect to the cylinder head may reduce performance, or worse, cause damage to the internal combustion engine or parts thereof. As such, the coupling between the injector and the cylinder head should take into account e.g. cylinder pressures and other forces pertaining to specific configurations of internal combustion engines.

In trucks, injectors are typically clamped to a cylinder head by a specifically designed bracket, for ease of assembly and maintenance. Clearly, for different motor designs, this amounts to different bracket designs, which adds to the production cost. In the prior art, efforts have been undertaken such as in CN102562396 and KR20020085007, that address a problem of having various space constraints around an internal combustion engine. To this end a bracket is proposed for clamping an injector having a groove for linearly positioning the bracket relative to its support points, so that the bracket can be flexibly adjusted in space.

However, these solutions typically use brackets that only take into account a single engine configuration, as the bracket design is optimized for providing a clamping force that opposes a specific set of engine related forces and pressures.

It remains a challenge to design a bracket that can be flexibly adjusted in clamping force, such that it is suitable for multiple configurations of internal combustion engines, without changing the design or specification of the bracket.

Summary of the invention

In one aspect, embodiments of the invention pertain to a bracket for clamping an injector onto a cylinder head of an internal combustion engine. The bracket comprises a clamp section, a mount section, and a support section. The clamp section is arranged for providing a clamping force onto the injector to clamp the injector onto the cylinder head.

The mount section extends from the clamp section and is arranged for mounting the bracket to the cylinder head adjacent the injector. The support section extends from the mount section opposite the clamp section and is arranged for supporting the bracket onto the cylinder head at a lever distance from the clamp section, to define the clamping force.

The support section comprises a plurality of support elements. Each of said support elements is arranged at a different lever distance, such that a selected support element from the plurality of support elements engages, in use, with the cylinder head at a selected lever distance, such that the bracket is supported on the selected support element only, to control a magnitude of the clamping force.

Another aspect of the invention pertains to a method of clamping an injector onto a cylinder head of an internal combustion engine by the bracket. The method comprises selecting, from a plurality of support elements arranged for supporting the bracket onto the cylinder head at different lever distances from a clamp section of the bracket, a support element at a selected lever distance to control a magnitude of a clamping force. The method further comprises modifying the cylinder head, such that the selected support element from the plurality of support element engages, in use, with the cylinder head at the selected lever distance such that the bracket is supported on the selected support element only. Next, the method comprises mounting the bracket to the cylinder head between the selected support

element and the injector, to provide the clamping force onto the injector to clamp the injector onto the cylinder head.

By having a bracket comprising multiple support points, a constant, e.g. predefined, preload force can be used to transfer multiple clamp loads to an injector without changing the bracket design. Accordingly, the bracket design and specification can be used for multiple types of injectors and engine heads, within a broad range of clamping requirements. Combined with having a uniformly prescriptible preload force, that is the same irrespective of a selected support element, this may facilitate manufacturing and assembly processes, as well as maintenance, and quality and inspection processes, since operators do not have to specify the preload force in the process but any rely on a prescribed fixed preload force irrespective of the clamp load.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further elucidated in the figures:

FIG 1 illustrates a first embodiment of a bracket 10 for clamping an injector onto a cylinder head of an internal combustion engine;

FIG 2 provides a bottom view of another or further embodiment of the bracket 10;

FIG 3 provides a bottom view of yet another or further embodiment of the bracket 10;

FIG 4 provides a schematic overview of a method 20 of clamping an injector onto a cylinder head of an internal combustion engine by a bracket;

FIGs 5A and 5B illustrate different results of the method 20.

DETAILED DESCRIPTION

Aspects of the invention relate to a bracket for clamping an injector onto a cylinder head of an internal combustion engine. The bracket comprises a clamp section arranged for providing a clamping force onto the injector to clamp the injector onto the cylinder head, a mount section extending from the clamp section

and arranged for mounting the bracket to the cylinder head adjacent the injector, and a support section extending from the mount section opposite the clamp section and arranged for supporting the bracket onto the cylinder head at a lever distance from the clamp section, to define the clamping force. The support section comprises a plurality of support elements, with each of the support elements arranged at a different lever distance, such that a selected support element from the plurality of support elements engages, in use, with the cylinder head at a selected lever distance, so that the bracket is supported on the selected support element only, to control a magnitude of the clamping force.

In preferred embodiments, each support element of the plurality of support elements is arranged along a longitudinal axis extending between the support section and the clamp section, to simplify the design of bracket and to optimize the ratio of clamping capacity to weight of bracket.

Additionally, in some embodiments the mount section can comprise a hole, having a centerline perpendicular to the longitudinal axis for accommodating a preload bolt, such that, in use, the preload bolt engages with the cylinder head, to provide a preload downward force for generating the clamping force.

In yet further embodiments, the centerline intersects the longitudinal axis, to have the preload force provide a single lever action from a selected support element of the plurality of support elements to the clamp section.

Preferably, each support element of the plurality of support elements comprises a convex semi sphere, to provide a well-defined contact surface for engaging with the cylinder head.

In other or further preferred embodiments, each support element of the plurality of support elements is equal in size, to facilitate preparation of the cylinder head.

In some embodiments, the clamp section comprises a plurality of branches, each branch of the plurality of branches arranged for providing at least part of the clamping force onto the injector, to distribute the clamping force onto the injector.

The invention is described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. In the drawings, the absolute and relative sizes of systems, components, layers, and

regions may be exaggerated for clarity. Embodiments may be described with reference to schematic and/or cross-section illustrations of possibly idealized embodiments and intermediate structures of the invention. In the description and drawings, like numbers refer to like elements throughout. Relative terms as well as derivatives thereof should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description and do not require that the system be constructed or operated in a particular orientation unless stated otherwise.

Now turning to FIG 1, there is illustrated a bracket 10 for clamping an injector 400 onto a cylinder head 500 of an internal combustion engine according to a first embodiment. Bracket 10 comprises a clamp section 110, a mount section 120, and a support section 130. Clamp section 110 is arranged for providing a clamping force F_C onto injector 400 to clamp injector 400 onto cylinder head 500. Mount section 120 extends from clamp section 110 and is arranged for mounting bracket 10 to cylinder head 500 adjacent injector 400, e.g. by a preload force F_P. Support section 130 extends from mount section 120 opposite clamp section 110 and is arranged for supporting bracket 10 onto cylinder head 500 at a lever distance from clamp section 110, to define the clamping force F_C. In the embodiment, the lever distance is thus determined by a distance between a clamping position, i.e. a central position where the clamping force is transmitted to the injector 400, and a supporting position, i.e. a centerline of any of a supporting element 135a or 135b, whichever is actually supported on the cylinder head 500. For example, a preload force F_P applied on mount section 120 when mounting bracket 10 to cylinder head 500 results, by lever action defined by lever distance $L_{A,B}$, in a clamping force F_C between clamp section 110 and injector 400. As shown in FIG 1, support section 130 comprises a plurality of support elements 135a,b. Each of support elements 135a,b is arranged at a different lever distance $L_{A,B}$ from clamp section 110. For example, the lever distance L_A between support element 135a and clamp section 110 is larger than the lever distance L_B between support element 135b and clamp section 110. FIG 1 shows that selected support element 135a from the plurality of support elements 135a,b engages, in use, with cylinder head 500 at selected lever

distance L_A, such that bracket 10 is supported on selected support element 135a only. For example, cylinder head 500 may comprise a centering hole to align with selected support element 135a, while material is removed from cylinder head 500 around non-selected support element 135b, such that bracket 10 is supported on selected support element 135a only. By having a bracket 10 comprising a plurality of support elements at different lever distances from clamp section 110, a selected support element can be arranged to engage, in use, with the cylinder head at a selected lever distance, to control a magnitude of the clamping force F_C without changing the design or specification of the bracket and without changing the magnitude of the preload force F_P. For example, by selecting a different support element, such as support element 135b instead of support element 135a in FIG 1, the magnitude of the clamping force F_C can be reduced, due to the relatively shorter lever distance L_B between selected support element 135b and clamp section 110. Although not depicted in FIG 1, the lever distance is typically dependent on the central mount section, typically a center bolt, which provides a downward clamping force F_P, which is transmitted, through the lever distance to a clamping force F_C.

In some embodiments, for example as shown in FIG 1, each support element 135a,b of the plurality of support elements comprises a convex semi sphere, to provide a well-defined contact surface for engaging with cylinder head 500. A convex spherical contact surface can for example engage with a centering hole in cylinder head 500, such that bracket 10 is aligned and pivotably supported on cylinder head 500. Alternatively, each support element 135 of the plurality of support elements may comprise a different shape protruding from support section 130, such as an end or a side of a cylinder, cone, or cuboid, such that each support element provides e.g. a flat, curved or double curved contact surface between support section 110 and cylinder head 500.

Preferably, each support element 135a,b of the plurality of support elements is equal in size, e.g. having an equal spherical diameter, or support width, or an equal length of protrusion from support section 130, to facilitate preparation of cylinder head 500, such that bracket 10 is supported on a selected support element only. Alternatively, support elements of the plurality of support elements 135a,b

can have a different size relative to each other, e.g. differing in diameter, width, or length of protrusion from support section 130, to match a surface of cylinder head 500.

FIG 2 provides a bottom view of another or further embodiment of bracket 10. Each support element 135a,b,c of the plurality of support elements is arranged along a single longitudinal axis 808 extending between support section 130 and clamp section 110. As shown in FIG 2, support element 135a is arranged on longitudinal axis 808 at lever distance L_A from clamp section 110, support element 135b is arranged on longitudinal axis 808 at lever distance L_B from clamp section 110, and support element 135c is arranged on longitudinal axis 808 at lever distance L_C from clamp section 110. Lever distances $L_{A,B,C}$ can be defined as the distance along longitudinal axis 808, from the location of clamp force F_C on clamp section 110 to support elements 135a,b, respectively.

By having each support element 135a,b,c of the plurality of support elements arranged along a single longitudinal axis 808 extending between support section 130 and clamp section 110, the design of bracket 10 can be simplified and the ratio of clamping capacity to weight of bracket 10 can be optimized. Preferably, longitudinal axis 808 is on a plane of symmetry of bracket 10, to further simplify and optimize the design of bracket 10. Alternatively, longitudinal axis 808 can be at an offset from the plane of symmetry of bracket 10.

Additionally, in some embodiments mount section 120 comprises a center hole 125, having a centerline perpendicular to longitudinal axis 808 for accommodating a preload center bolt, such that, in use, the preload bolt engages with cylinder head 500 to provide a preload downward force Fp for generating the clamping force Fc. The preload bolt can e.g. be used for mounting bracket 10 to cylinder head 500 and for providing the preload force F_P as shown in FIG 1.

In preferred embodiments, the centerline of hole 125 intersects longitudinal axis 808, e.g. at a fixed distance R from the clamping force F_C on clamp section 110, such that the preload force F_P provides a single lever action from a selected support element of the plurality of support elements 135a,b,c, to the clamp section 110, without providing a secondary, e.g. lateral, lever action on bracket 10.

FIG 3 shows yet another or further embodiment of the bracket 10, in a bottom view. Here, clamp section 110 comprises a plurality of branches, e.g. two branches 115, 116, each branch 115, 116 arranged for providing at least part of the clamping force F_C onto injector 400. For example, the total clamping force F_C can be divided between the plurality of branches 115, 116 by a first part of the clamping force $F_{C,1}$ on branch 115 and a second part of the clamping force $F_{C,2}$ on branch 116. Alternatively, bracket 10 may for example comprise branches that do not contribute to providing a clamping force onto injector 400, but instead are designed e.g. for holding a cable or for alignment of bracket 10, injector 400, or other components.

As shown in FIG 3, the clamping force $F_{C,1}$, $F_{C,2}$ on branches 115, 116, respectively, is provided on a lateral axis 909 perpendicular to the longitudinal axis 808 extending between support section 130 and clamp section 110. Accordingly, the lever distances $L_{A,B}$ can be defined as the distance along longitudinal axis 808, between a central clamping position on axis 909 and support elements 135a,b, respectively.

In FIG 4, a schematic overview is provided of a method 20 of clamping an injector 400 onto a cylinder head 500 of an internal combustion engine by the bracket 10. The method 20 comprises, in a first step 21, selecting a support element 135 at a selected lever distance, from a plurality of support elements 135 arranged for supporting the bracket 10 onto the cylinder head 500 at different lever distances from a clamp section 110 of the bracket 10, to control a magnitude of a clamping force. In a second step 22, the method 20 comprises modifying the cylinder head 500, such that the selected support element 135 from the plurality of support element 135 engages, in use, with the cylinder head 500 at the selected lever distance such that the bracket 10 is supported on the selected support element 135 only.

An example is given in FIG 5A and 5B. In FIG 5A, cylinder head 500 is modified such that selected support element 135a from the plurality of support elements 135a,b engages, in use, with a centering hole in cylinder head 500 at the

selected lever distance. Material around the non-selected support element 135b is removed from cylinder head 500, such that bracket 10 is supported on selected support element 135a only. Alternatively, in FIG 5B, support element 135b is defined as the selected support element 135, and cylinder head 500 is modified such that selected support element 135b engages in use with a centering hole in cylinder head 500 at the corresponding selected lever distance, while material around non-selected support element 135a is removed from cylinder head 500, such that bracket 10 is supported on selected support element 135b only.

Back to FIG 4, in a third step 23 of the method 20, the bracket 10 is mounted to the cylinder head 10 between the selected support element 135 and the injector 400, to provide the clamping force onto the injector 400 to clamp the injector 400 onto the cylinder head 500.

In this way, the same bracket design and specification can be used on different engines and/or injectors spread over different projects, instead of requiring a new design and/or specification when a change of bracket would normally be required, thereby providing a cost advantage. Besides that, by modifying the cylinder head, the clamping force can be controlled with the same bracket in an easier, more cost efficient and less time consuming way, because of improved manufacturing, assembly, maintenance, and quality and inspection processes.

Conclusies

1. Een beugel voor het klemmen van een injector op een cilinderkop van een interne verbrandingsmotor, omvattende:
   - een klemgedeelte, dat is ingericht voor het verschaffen van een klemkracht op de injector om de injector op de cilinderkop te klemmen;
   - een bevestigingsgedeelte, dat zich uitstrekt vanaf het klemgedeelte en dat is ingericht voor het bevestigen van de beugel op de cilinderkop naast de injector; en
   - een steungedeelte, dat zich uitstrekt vanaf het bevestigingsgedeelte tegenover het klemgedeelte en dat is ingericht voor het steunen van de beugel op de cilinderkop op een hefboomafstand van het klemgedeelte, om de klemkracht te bepalen;

   waarbij het steungedeelte een veelvoud aan steunelementen omvat, waarbij elk van de genoemde steunelementen is ingericht op een verschillende hefboomafstand, zodanig dat, in gebruik, een geselecteerd steunelement uit het veelvoud aan steunelementen ingrijpt op de cilinderkop op een geselecteerde hefboomafstand, zodat de beugel alleen is gesteund op het geselecteerde steunelement, om een grootte van de klemkracht te regelen.

2. Beugel volgens conclusie 1, waarbij elk steunelement van het veelvoud aan steunelementen is ingericht langs een longitudinale as, welke zich uitstrekt tussen het steungedeelte en het klemgedeelte.

3. Beugel volgens conclusie 2, waarbij het bevestigingsgedeelte een gat omvat, met een hartlijn die loodrecht is op de longitudinale as om

plaats te hebben voor een voorspanbout, zodanig dat, in gebruik, de voorspanbout ingrijpt op de cilinderkop.

4. Beugel volgens conclusie 3, waarbij de hartlijn de longitudinale as snijdt.

5. Beugel volgens één van de voorgaande conclusies, waarbij elk steunelement van het veelvoud aan steunelementen een uitstekende halve bol omvat.

6. Beugel volgens één van de voorgaande conclusies, waarbij elk steunelement van het veelvoud aan steunelementen gelijk is in grootte.

7. Beugel volgens één van de voorgaande conclusies, waarbij het klemgedeelte een veelvoud aan vertakkingen omvat, waarbij elke vertakking van het veelvoud aan vertakkingen is ingericht voor het verschaffen van ten minste een deel van de klemkracht op de injector.

8. Een werkwijze voor het klemmen van een injector op een cilinderkop van een interne verbrandingsmotor door de beugel volgens conclusie 1, omvattende:
   - het selecteren, uit een veelvoud aan steunelementen die zijn ingericht voor het steunen van de beugel op de cilinderkop op verschillende hefboomafstanden van een klemgedeelte van de beugel, een steunelement op een geselecteerde hefboomafstand om een grootte van de klemkracht te regelen;

- het aanpassen van de cilinderkop, zodanig dat, in gebruik, het geselecteerde steunelement uit het veelvoud aan steunelementen ingrijpt op de cilinderkop op de geselecteerde hefboomafstand zodat de beugel alleen is gesteund op het geselecteerde steunelement; en
- het bevestigen van de beugel op de cilinderkop tussen het geselecteerde steunelement en de injector, om de klemkracht op de injector te verschaffen om de injector op de cilinderkop te klemmen.

9. Een werkwijze volgens conclusie 8, waar de beugels zijn bevestigd aan de cilinderkop met een voorspanbevestigingskracht, welke hetzelfde is ongeacht een geselecteerd steunelement.

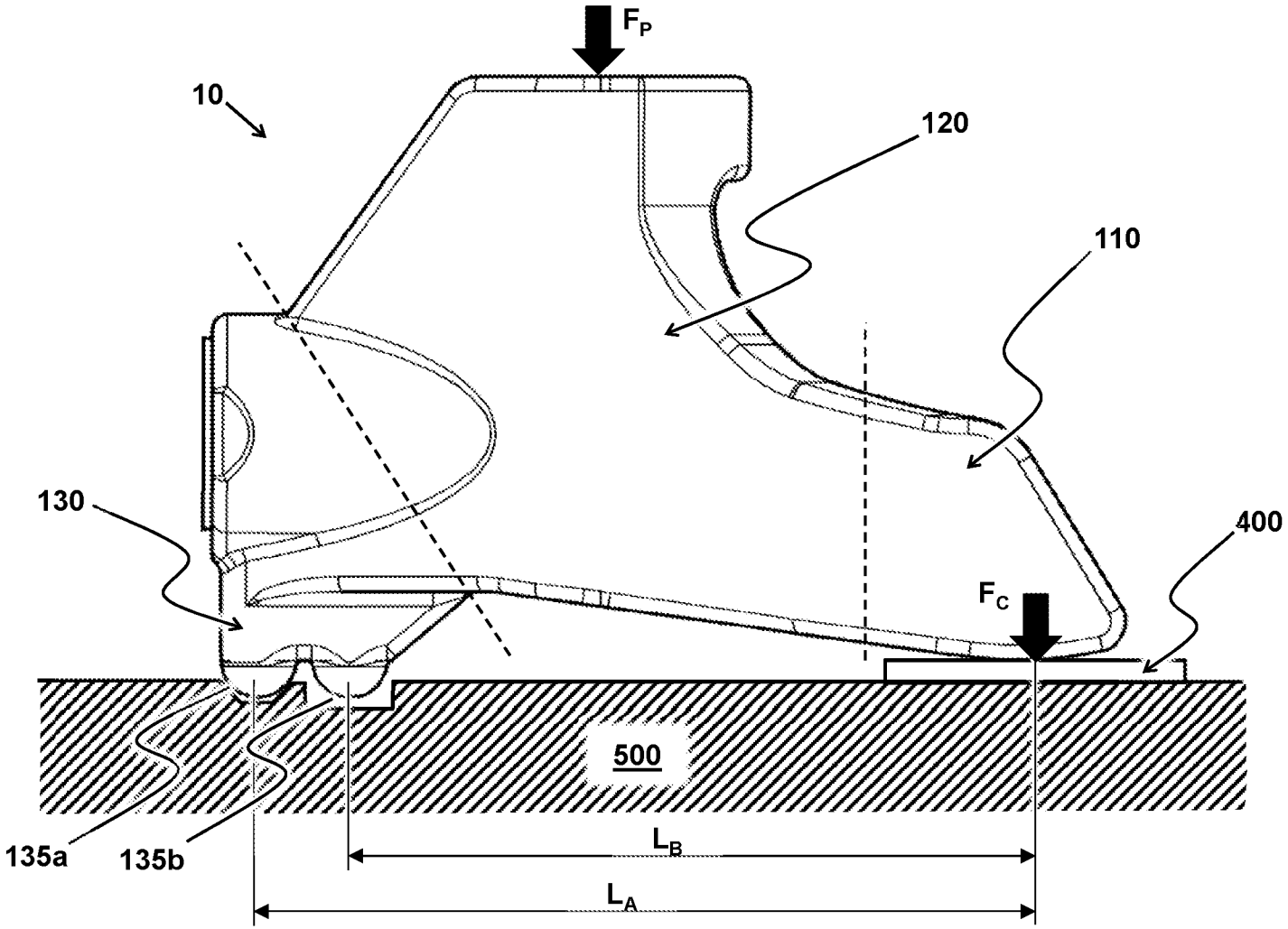

FIG 1

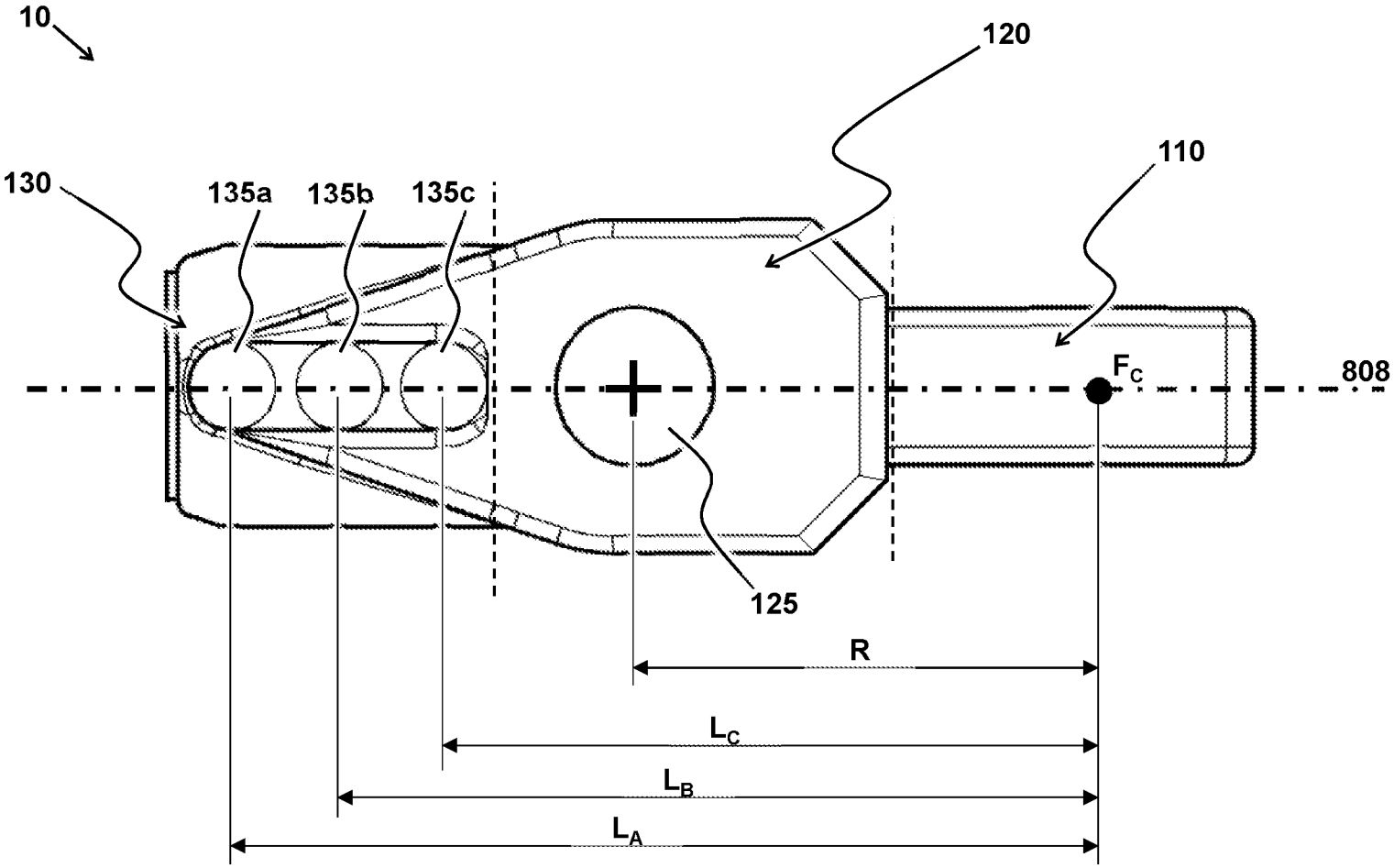

FIG 2

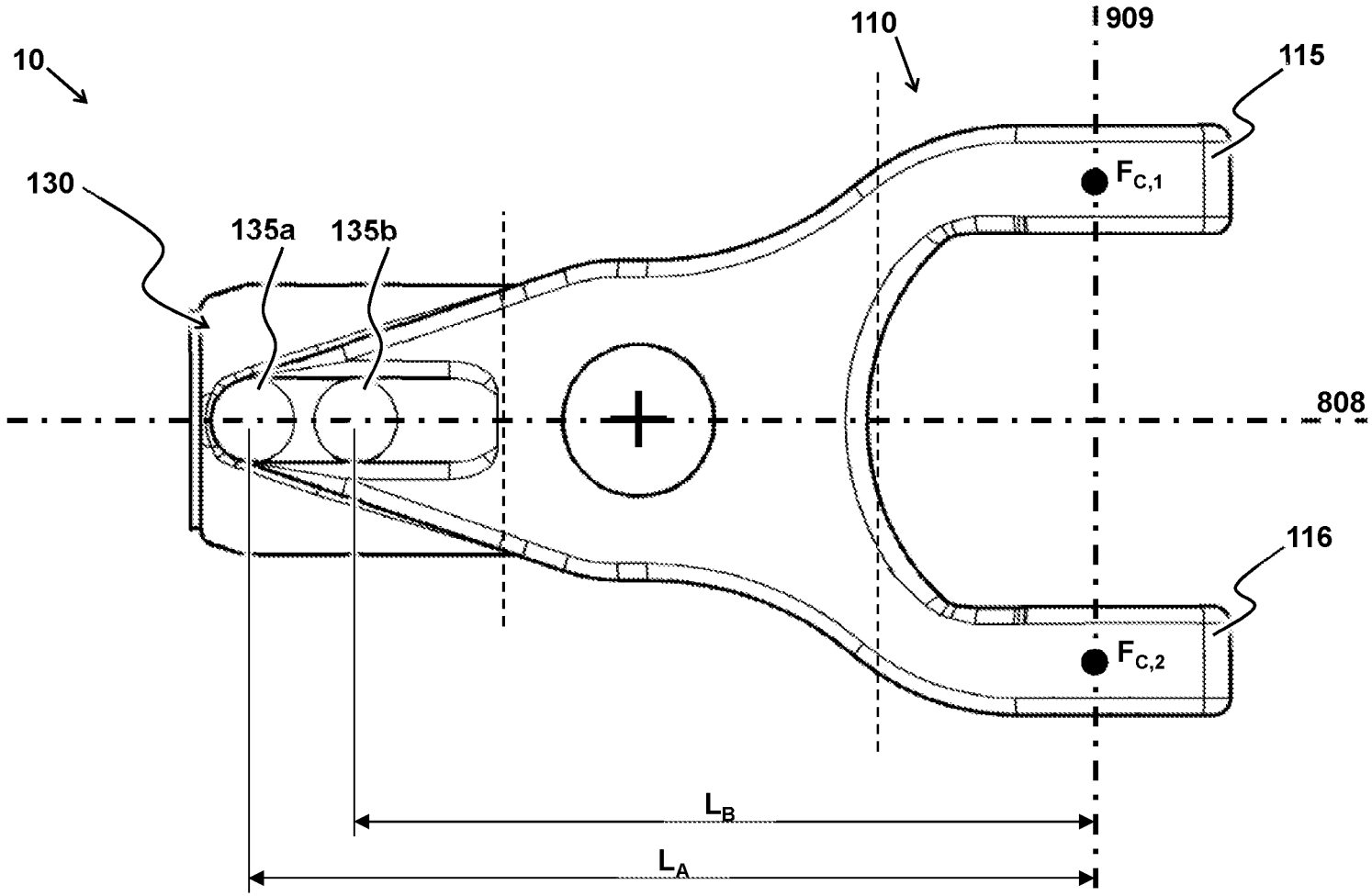

FIG 3

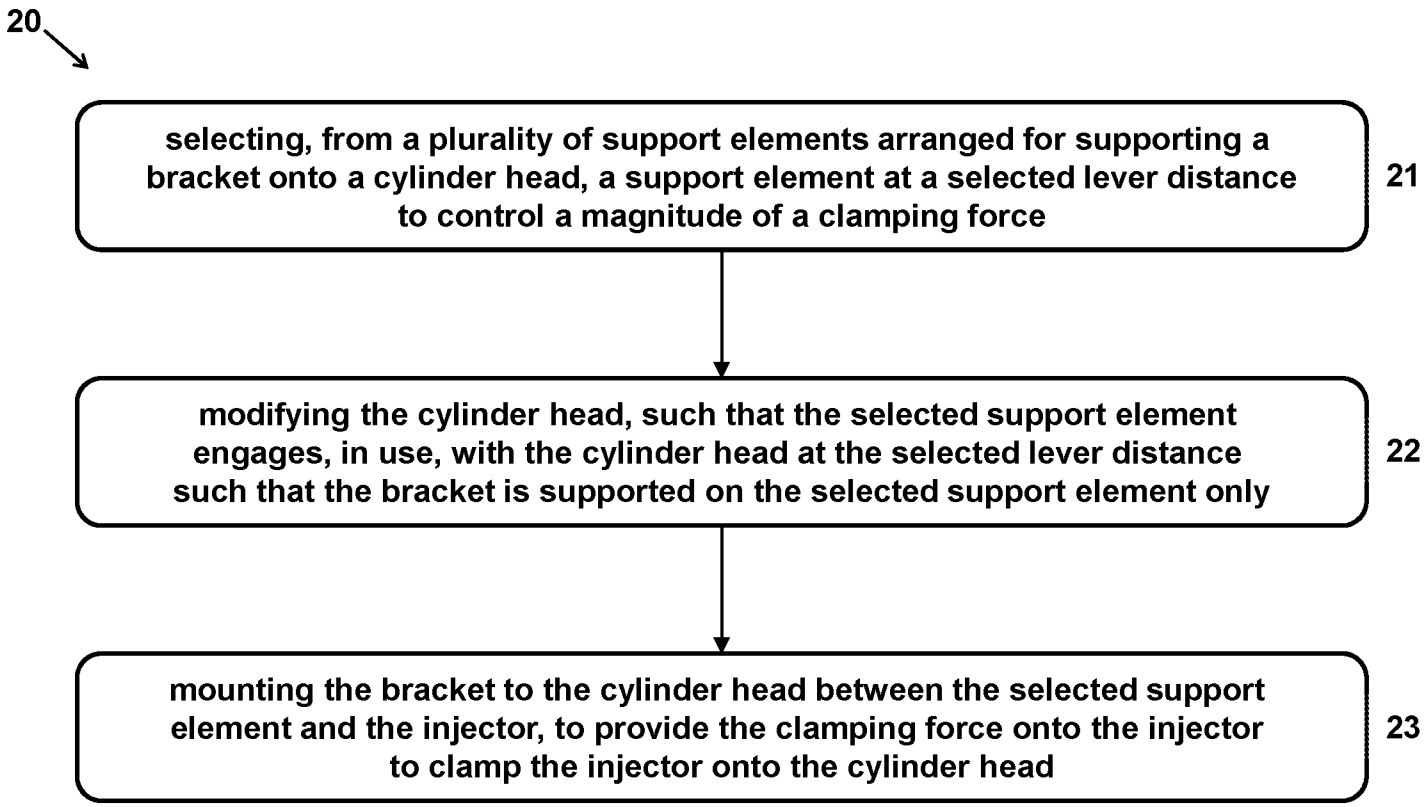
20
selecting, from a plurality of support elements arranged for supporting a bracket onto a cylinder head, a support element at a selected lever distance to control a magnitude of a clamping force
21
modifying the cylinder head, such that the selected support element engages, in use, with the cylinder head at the selected lever distance such that the bracket is supported on the selected support element only
22
mounting the bracket to the cylinder head between the selected support element and the injector, to provide the clamping force onto the injector to clamp the injector onto the cylinder head
23

FIG 4

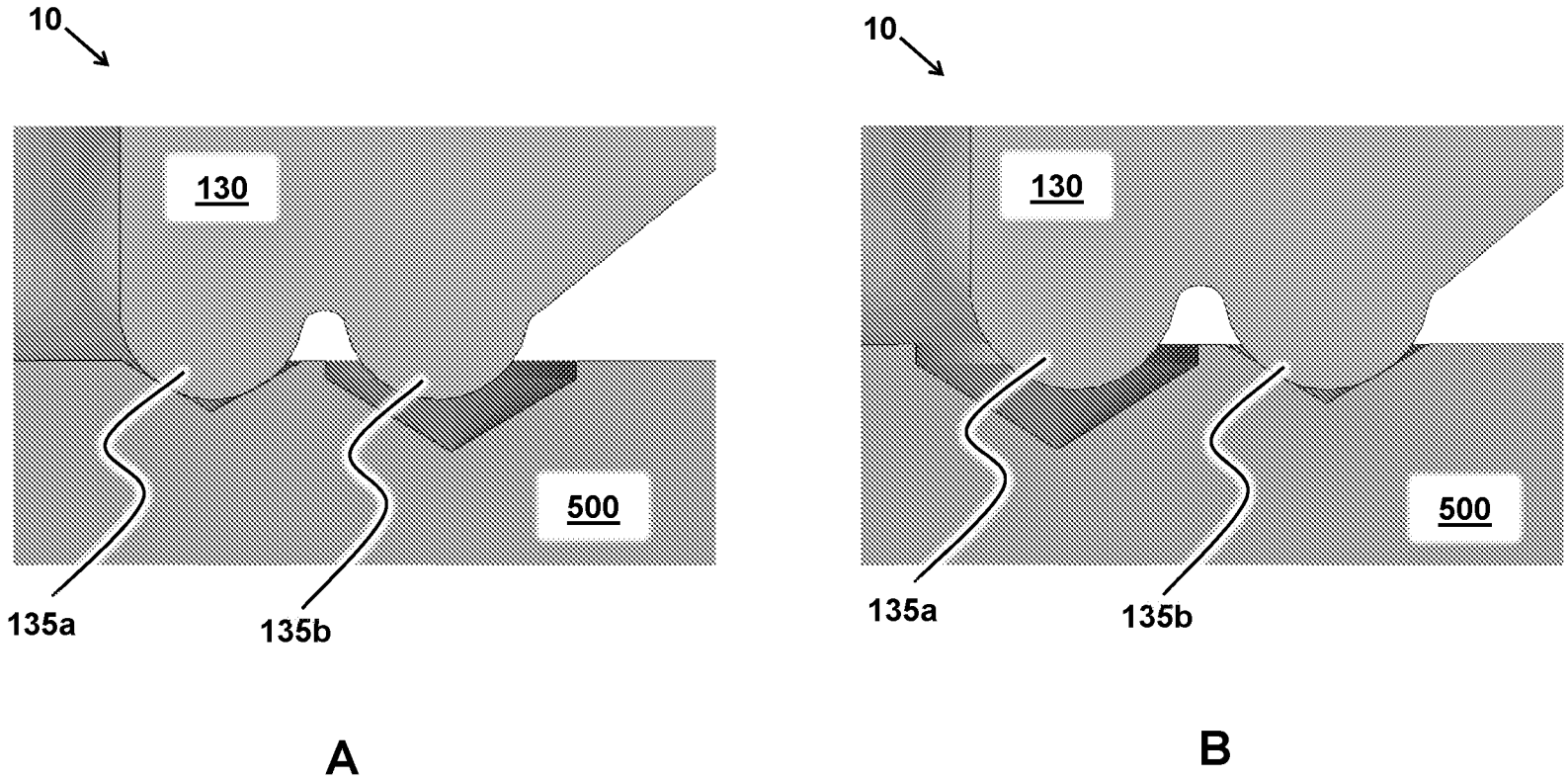

FIG 5

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
Nederlands aanvraag nr. **2027770**	Indieningsdatum **18-03-2021**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **DAF Trucks N.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **05-06-2021**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN78896**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

Zie onderzoeksrapport

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**Zie onderzoeksrapport**

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

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**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 2027770

A. CLASSIFICATIE VAN HET ONDERWERP
INV. F02M61/14
ADD.

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

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
F02M

Onderzochte andere documentatie dan de mimimum 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	DE 10 2011 088293 A1 (CONTINENTAL AUTOMOTIVE GMBH [DE]) 13 juni 2013 (2013-06-13) * alinea [0036] - alinea [0057]; figuren 1-8 * * samenvatting *	1-9
A	US 2010/300408 A1 (ARONHALT DANIEL E [US] ET AL) 2 december 2010 (2010-12-02) * alinea [0017] - alinea [0023]; figuren 1-4 * * samenvatting *	1-9
A	DE 20 2015 103512 U1 (FORD GLOBAL TECH LLC [US]) 2 oktober 2015 (2015-10-02) * alinea [0031]; figuren 1-3 * * samenvatting *	1-9

-/--

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie 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 octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), 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 octrooiaanvrage, 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

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
15 november 2021	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hermens, Sjoerd

1

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 2027770

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 6 116 218 A (SATO TATSUO [JP] ET AL) 12 september 2000 (2000-09-12) * het gehele document * * figuur 1 * -----	1-9

Formulier PCT/ISA/201 (vervolg tweede blad) (Januari 2004)

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 2027770

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
DE 102011088293 A1	13-06-2013	GEEN	
US 2010300408 A1	02-12-2010	CN 102449298 A	09-05-2012
		EP 2440772 A2	18-04-2012
		US 2010300408 A1	02-12-2010
		WO 2010138789 A2	02-12-2010
DE 202015103512 U1	02-10-2015	CN 204877757 U	16-12-2015
		DE 202015103512 U1	02-10-2015
		RU 2015128608 A	18-01-2017
		US 2016025056 A1	28-01-2016
US 6116218 A	12-09-2000	CN 1205050 A	13-01-1999
		DE 69720951 T2	06-11-2003
		EP 0859909 A1	26-08-1998
		JP 3765132 B2	12-04-2006
		JP H1082355 A	31-03-1998
		KR 20000064346 A	06-11-2000
		MY 125465 A	30-08-2006
		TW 351740 B	01-02-1999
		US 6116218 A	12-09-2000
		WO 9810188 A1	12-03-1998

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN78896	18.03.2021		NL2027770

International Patent Classification (IPC)
INV. F02M61/14

Applicant
DAF Trucks N.V.

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
	Hermens, Sjoerd

Application number

WRITTEN OPINION

NL2027770

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	1-9
	No:	Claims	
Inventive step	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability	Yes:	Claims	1-9
	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

Reference is made to the following document:

D1 DE 10 2011 088293 A1 (CONTINENTAL AUTOMOTIVE GMBH [DE]) 13 juni 2013 (2013-06-13)

1. D1 discloses (cf. alinea [0036] - alinea [0057]; figuren 1-8):

"Een beugel (100) voor het klemmen van een injector (116) op een cilinderkop van een interne verbrandingsmotor, omvattende:
- een klemgedeelte (113), dat is ingericht voor het verschaffen van een klemkracht op de injector (116) om de injector op de cilinderkop (123) te klemmen;
- een bevestigingsgedeelte, dat zich uitstrekt vanaf het klemgedeelte en dat is ingericht voor het bevestigen van de beugel (100) op de cilinderkop (123) naast de injector; en
- een steungedeelte (103), dat zich uitstrekt vanaf het bevestigingsgedeelte tegenover het klemgedeelte (113) en dat is ingericht voor het steunen van de beugel(100) op de cilinderkop (123) op een hefboomafstand van het klemgedeelte (113), om de klemkracht te bepalen;"

The subject-matter of claim 1 therefore differs from this known "beugel" in that "het steungedeelte een veelvoud aan steunelementen omvat, waarbij elk van de genoemde steunelementen is ingericht op een verschillende hefboomafstand, zodanig dat, in gebruik, een geselecteerd steunelement uit het veelvoud aan steunelementen ingrijpt op de cilinderkop op een geselecteerde hefboomafstand, zodat de beugel alleen is gesteund op het geselecteerde steunelement, om een grootte van de klemkracht te regelen."

The subject-matter of claim 1 is therefore new.

The problem to be solved by the present invention may be regarded as: to design a bracket that can be flexibly adjusted in having a clamping force, such that it is suitable for multiple configurations of internal combustion engines, without changing the design of the bracket

In none of the in the search report cited documents can be found an indication that would incite the man skilled in the art to modify the bracket of D1 in a way that would lead to a plurality of support elements.

the subject-matter of claim 1 does therefore involve an inventive step.

2. Claims 2-9 are dependent on claim 1 and also seem to meet the requirements with respect to novelty and inventive step.