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73 Octrooihouder(s):

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54 **Method for jacking up a heavy load, and a filler used in this method**

57 Method for jacking up a heavy load making use of a heavy-duty climbing jack (1) comprising a main body (2) and a stamp (3), wherein the main body (2) and the stamp (3) are repeatedly moved with respect to each other so as to cyclically have the stamp (3) protrude from the main body (2) and be retracted in-side the main body (2), and further making use of multiple fillers (4, 5, 6) to be placed in a predetermined sequence under the main body (2) and stamp (3) respectively of the climbing jack (1), which placement of the fillers (4, 5, 6) is executed in concert with the repeated movement of the stamp (3) and the main body (2) of the climbing jack (1) with respect to each other so as to gradually raise the climbing jack (1) from the ground with the fillers underneath said climbing jack (1), wherein the fillers are provided as a composite (4, 5, 6) of bamboo strands with a resin and compressed to have a density in the range of 1100 – 1200 kg/m³.

Method for jacking up a heavy load, and a filler used in this method

5 The invention relates to a method for jacking up a heavy load making use of a heavy-duty climbing jack comprising a main body and a stamp, wherein the main body and the stamp are repeatedly moved with respect to each other so as to cyclically have the stamp protrude from the main body and be retracted inside the main body, and further making use of multiple fillers to be placed in a predetermined sequence under the main body and stamp respectively of the climbing jack, which placement of the fillers is executed in concert with the repeated movement of the stamp and the main body of the climbing jack with respect to each other so as to gradually raise the climbing jack from the ground with the fillers underneath said climbing jack.

15 This method is used in practice for lifting heavy loads from the ground. The heavy-duty climbing jack used for this purpose has a lifting capacity of usually 100, 200 or 500 tons.

20 The fillers that are used in this method are conventionally made from hardwood taken from rainforests, which represents an appreciable burden to the environment. More and more it is undesirable and no longer considered acceptable that such hardwood is used in the known method for jacking up a heavy load.

25 At the website <https://www.mammoet.com/news/jacking-up-on-sustainability/> it has been proposed to substitute the hardwooden fillers by bamboo fillers, but practice has shown this is not as straightforward as it may appear. Bamboo fillers are too soft and not capable to withstand the high forces that occur when heavy loads need to be lifted.

30 An object of the invention is therefore to provide an alternative for the use of hardwood fillers in the process of lifting a heavy load from the ground.

35 Also an object of the invention is to provide such an alternative which can be used to replace the known hardwood fillers and which is environmentally friendly, in particular

by gaining the benefits of a high take-up of coal dioxide from the environment.

According to the invention a method and heavy-duty filler are proposed in accordance with one or more of the appended claims.

Essentially according to the invention the fillers are provided as a composite of bamboo strands with a resin and arranged to have a density in the range of 1100 - 1200 kg/m³. Using bamboo strands in the composite prevents that hardwood needs to be harvested from the rainforests. Bamboo is a material that is advantageous in terms of its high growth rate and capability to bind large amounts of carbon dioxide. It is not essential which type of resin is used, as long as the resin has gluing properties. Using said composite with a density in the range of 1100 - 1200 kg/m³ provides sufficient strength to be applied in a method for lifting heavy loads.

It is particularly desirable that the composite of the bamboo strands with the resin has a modulus of elasticity as measured in compression parallel to a grain ($E_c,90$) of the composite of at least 1.6 kN per square millimeter. When this parameter is satisfied the lifting of heavy loads can be executed reliably and securely also with repeated use of the composite fillers.

The composite of bamboo strands with a resin is suitably derived from a process in which the composite is press manufactured by pressing bamboo strands together with resin in a mould and subsequently cured.

The invention is also embodied in a composite as described herein, which is embodied as a composite of bamboo strands with a resin and which is compressed to a density in the range of 1100 - 1200 kg/m³, and which preferably has a modulus of elasticity as measured in compression parallel to a grain ($E_c,90$) of the composite of at least 1.6 kN per square millimeter.

The invention will hereinafter be further elucidated with reference to the drawing of an exemplary embodiment of an apparatus according to the invention that is not limiting as to the appended claims.

In the drawing:

-figure 1 shows a series of steps of a method according to the invention for lifting a heavy load; and

5 -figure 2 shows a composite filler that is used in the method of the invention.

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

Figure 1 shows a series of steps numbered 1 - 11, wherein the lifting of a climbing jack 1 is shown. In the first step the climbing jack in general has been referred to with reference 1. The climbing jack 1 comprises a main body 2
10 and a stamp 3, and in this step 1 the stamp 3 still resides within the main body 2.

In step 2 the stamp 3 is protruding from within the main body 2 so as to lift the main body 2 from the ground.
15 Subsequently in step 3 two composite fillers 4 are provided on the left of the protruding stamp 3, and two composite fillers 5 are provided on the right of the protruding stamp 3. The composite fillers 4, 5 are derived from a process in which the composite 4, 5 is press manufactured by pressing bamboo
20 strands together with resin in a mould and subsequently cured. This also applies to the composite fillers 6 which are mentioned in the following paragraph.

Both the composite fillers 4 on the left and the composite fillers 5 on the right of the stamp 3 have composite
25 strips 4', 5' on top to ensure that after a subsequent step 4 in which the stamp 3 is retracted inside the main body 2 of the climbing jack 1, there is sufficient room below the stamp 3 to enable that in step 5 a series of further composite fillers 6 can be placed underneath the stamp 3 of the climbing
30 jack 1. After this is done in step 6 the stamp 3 is made to protrude again from the main body 2 so as to support the climbing jack 1 on the composite fillers 6 below the stamp 3, which then enables that the composite strips 4' and 5' on top of the composite fillers 4 and 5 on the left and on the right
35 of the stamp 3 can be removed.

Subsequently in steps 7 - 10 the same operations are performed as shown in steps 3 - 6 for raising the climbing

jack 1 to a next level by bringing in composite fillers at the level of the arrows 7, the difference being that the operations with the composite fillers on the level of the arrows 7 are executed at right angles with reference to the composite fillers previously provided immediately underneath the level of the arrows 7.

Finally in step 11 the climbing jack 1 is made to rest on two layers of composite fillers as provided in the previous steps 1 - 10.

The composite fillers 4, 5, 6 used in this method of the invention are shown in figure 2. The dimensions of the composite fillers are the same as the hardwooden fillers used in the prior art, notably having a length L of approximately 1 m (1050 mm), and a square cross area W x H of 10 x 10 cm. Further preferable features of the composite filler of the invention are the following:

- the composite filler has a density in the range of 1100 - 1200 kg/m³;
- the composite filler has a modulus of elasticity as measured in compression parallel to a grain ($E_c,90$) of the composite (of at least 1.6 kN per square millimeter;
- the composite filler is derived from a process in which the filler is press manufactured by pressing bamboo strands together with resin in a mould and subsequently cured.

Although the invention has been discussed in the foregoing with reference to an exemplary embodiment of the method and composite filler of the invention, the invention is not restricted to this particular embodiment which can be varied in many ways without departing from the invention. The discussed exemplary embodiment shall therefore not be used to construe the appended claims strictly in accordance therewith. On the contrary the embodiment is merely intended to explain the wording of the appended claims without intent to limit the claims to this exemplary embodiment. The scope of protection of the invention shall therefore be construed in accordance with the appended claims only, wherein a possible ambiguity in the wording of the claims shall be resolved using this exemplary embodiment.

Aspects of the invention are itemized in the following section.

1. Method for jacking up a heavy load making use of a heavy-duty climbing jack (1) comprising a main body (2) and a stamp (3), wherein the main body (2) and the stamp (3) are repeatedly moved with respect to each other so as to cyclically have the stamp (3) protrude from the main body (2) and be retracted inside the main body (2), and further making use of multiple fillers (4, 5, 6) to be placed in a predetermined sequence under the main body (2) and stamp (3) respectively of the climbing jack (1), which placement of the fillers (4, 5, 6) is executed in concert with the repeated movement of the stamp (3) and the main body (2) of the climbing jack (1) with respect to each other so as to gradually raise the climbing jack (1) from the ground with the fillers underneath said climbing jack (1), **characterized in that** the fillers are provided as a composite (4, 5, 6) of bamboo strands with a resin and compressed to have a density in the range of 1100 - 1200 kg/m³.

2. Method according to claim 1, **characterized in that** the composite (4, 5, 6) has a modulus of elasticity as measured in compression parallel to a grain ($E_c, 90$) of the composite (4, 5, 6) of at least 1.6 kN per square millimeter.

3. Method according to claim 1 or 2, **characterized in that** the composite (4, 5, 6) is derived from a process in which the composite (4, 5, 6) is press manufactured by pressing bamboo strands together with resin in a mould and subsequently cured.

4. Heavy-duty filler, **characterized in that** the filler is provided as a composite (4, 5, 6) of bamboo strands with a resin and compressed to have a density in the range of 1100 - 1200 kg/m³.

5. Heavy-duty filler according to claim 4, **characterized in that** the composite (4, 5, 6) has a modulus of elasticity as measured in compression parallel to a grain ($E_c, 90$) of the composite (4, 5, 6) of at least 1.6 kN per square millimeter.

6. Heavy-duty filler according to claim 4 or 5, **char-**

acterized in that the composite (4, 5, 6) is derived from a process in which the composite (4, 5, 6) is press manufactured by pressing bamboo strands together with resin in a mould and subsequently cured.

CONCLUSIES

1. Werkwijze voor het heffen van een zware last onder gebruikmaking van een hoog vermogen klimvijzel (1) omvattende een hoofdlichaam (2) en een stempel (3), waarbij het hoofdlichaam (2) en de stempel (3) herhaald ten opzichte van elkaar
5 bewogen worden teneinde te bewerkstelligen dat op cyclische wijze de stempel (3) zich uitstrekt vanuit het hoofdlichaam (2) en wordt ingetrokken tot in het hoofdlichaam (2), en verder gebruikmakend van meerdere vuldelen (4, 5, 6) om in een voorafbepaalde volgorde onder het hoofdlichaam (2) en de stem-
10 pel (3) van de klimvijzel (1) te worden geplaatst, welke plaatsing van de vuldelen (4, 5, 6) uitgevoerd wordt afgestemd op de herhaalde beweging van de stempel (3) en het hoofdlichaam (2) van de klimvijzel (1) ten opzichte van elkaar teneinde de klimvijzel (1) geleidelijk vanaf de grond te verheffen met de vuldelen geplaatst onder genoemde klimvijzel (1),
15 **met het kenmerk**, dat de vuldelen voorzien zijn als een composiet (4, 5, 6) van bamboestrengen en een hars, welke is samengedrukt tot een dichtheid in het bereik van 1100 tot 1200 kg/m³.

20 2. Werkwijze volgens conclusie 1, **met het kenmerk**, dat de composiet (4, 5, 6) een elasticiteitsmodulus bezit zoals gemeten tijdens samenpersen evenwijdig aan een vezel (E_{c,90}) van de composiet (4, 5, 6) van ten minste 1,6 kN per vierkante millimeter.

25 3. Werkwijze volgens conclusie 1 of 2, **met het kenmerk**, dat de composiet (4, 5, 6) verkregen wordt uit een werkwijze in welke de composiet (4, 5, 6) drukvervaardigd wordt door het samenpersen van bamboestrengen samen met een hars in een vorm en daaropvolgend uitgehard.

30 4. Zwaarbelastbaar vuldeel, **met het kenmerk**, dat het vuldeel voorzien is als een composiet (4, 5, 6) van bamboestrengen met een hars en samengedrukt tot een dichtheid in het bereik van 1100 - 1200 kg/m³.

35 5. Zwaarbelastbaar vuldeel volgens conclusie 4, **met het kenmerk**, dat de composiet (4, 5, 6) een elasticiteitsmodulus bezit zoals gemeten tijdens samenpersen evenwijdig aan een

vezel (Ec,90) van de composiet (4, 5, 6) van ten minste 1,6 kN per vierkante millimeter.

5 6. Zwaarbelastbaar vuldeel volgens conclusie 4 of 5, **met het kenmerk**, dat de composiet (4, 5, 6) verkregen wordt uit een werkwijze in welke de composiet (4, 5, 6) drukvervaardigd wordt door het samendrukken van bamboestrengen samen met hars in een vorm en daaropvolgend uitgehard.

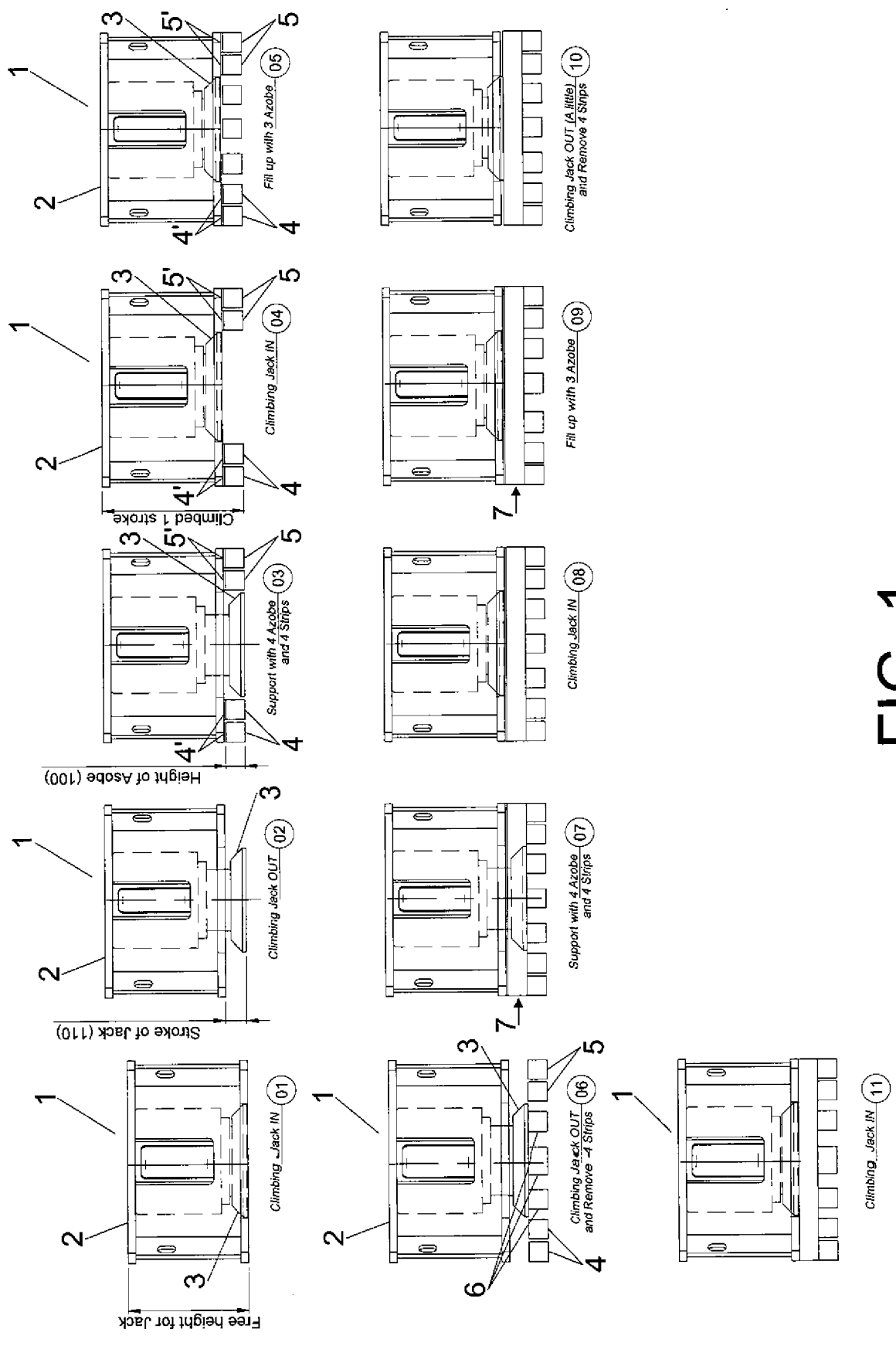


FIG. 1

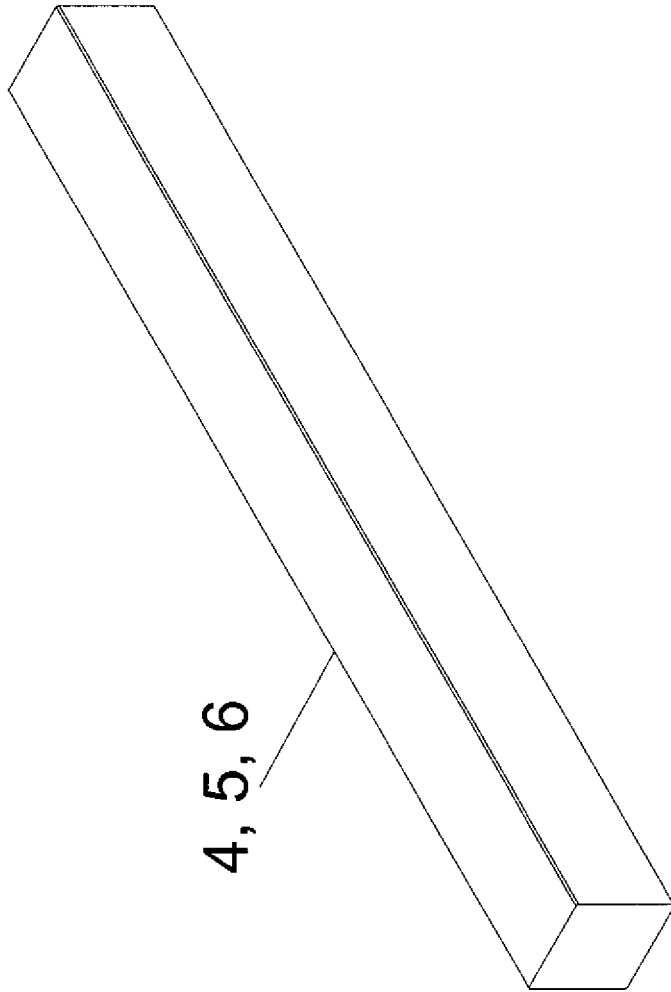
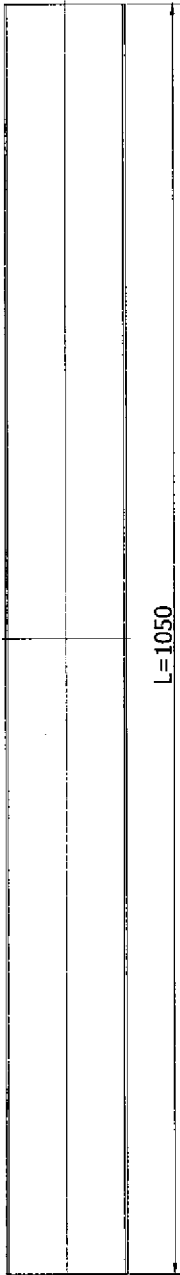
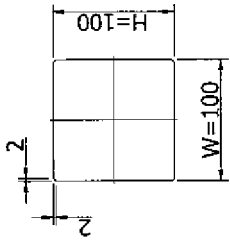


FIG. 2

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE 018206 NL-PD-VB
Nederlands aanvraag nr. 2021580	Indieningsdatum 07-09-2018
	Ingeroepen voorrangdatum
Aanvrager (Naam) Mammoet Holding B.V.	
Datum van het verzoek voor een onderzoek van internationaal type 27-10-2018	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN72288
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC) B66F3/24;B66F3/46;E04C3/12;B32B9/02	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC	B66F;E04C;B32B;B65G;B65D
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 2021580

A. CLASSIFICATIE VAN HET ONDERWERP INV. B66F3/24 B66F3/46 E04C3/12 B32B9/02 ADD.		
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) B66F E04C B32B B65G B65D		
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.
Y,D	Mammoet: "Jacking up on sustainability ; Mammoet", 31 december 2017 (2017-12-31), XP055594766, Gevonden op het Internet: URL:https://www.mammoet.com/news/2017/jack ing-up-on-sustainability/ [gevonden op 2019-06-06] in de aanvraag genoemd * het gehele document *	1-3,5
X	----- CN 101 007 420 A (UNIV NANJING FORESTRY [CN]) 1 augustus 2007 (2007-08-01)	4,6
Y	* samenvatting * * alinea [0001] * * figuren *	1-3,5
	----- -/--	
<input checked="" type="checkbox"/>	Verdere documenten worden vermeld in het vervolg van vak C.	<input checked="" type="checkbox"/> Leden van dezelfde octrooifamilie zijn vermeld in een bijlage
° Speciale categorieën van aangehaalde documenten		"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
"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft		"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur
"D" in de octrooiaanvraag vermeld		"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
"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven		"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie
"L" om andere redenen vermelde literatuur		
"O" niet-schriftelijke stand van de techniek		
"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur		
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	
7 juni 2019		
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	Cabral Matos, A	

**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 2021580

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
Y	US 2016/325530 A1 (SLAVEN JR LELAND [US]) 10 november 2016 (2016-11-10) * samenvatting * * alinea [0002] * * alinea [0018] * * alinea [0020] - alinea [0022] * * figuur + * -----	2,5
A	US 2017/254066 A1 (SMITH LARRY [US] ET AL) 7 september 2017 (2017-09-07) * samenvatting * * alinea [0045] - alinea [0046] * * figuren 5-9 * -----	1-6

**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 2021580

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
CN 101007420	A	01-08-2007	GEEN
US 2016325530	A1	10-11-2016	GEEN
US 2017254066	A1	07-09-2017	GEEN

WRITTEN OPINION

File No. SN72288	Filing date (<i>day/month/year</i>) 07.09.2018	Priority date (<i>day/month/year</i>)	Application No. NL2021580
International Patent Classification (IPC) INV. B66F3/24 B66F3/46 E04C3/12 B32B9/02			
Applicant Mammoet Holding B.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 Cabral Matos, A
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WRITTEN OPINION**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	1-3, 5
	No: Claims	4, 6
Inventive step	Yes: Claims	
	No: Claims	1-6
Industrial applicability	Yes: Claims	1-6
	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 documents:
 - D1 Mammoet: "Jacking up on sustainability | Mammoet", , 31 december 2017 (2017-12-31), XP055594766, Gevonden op het Internet: URL:<https://www.mammoet.com/news/2017/jacking-up-on-sustainability/> [gevonden op 2019-06-06] in de aanvraag genoemd
 - D2 CN 101 007 420 A (UNIV NANJING FORESTRY [CN]) 1 augustus 2007 (2007-08-01)
 - D3 US 2016/325530 A1 (SLAVEN JR LELAND [US]) 10 november 2016 (2016-11-10)
- 2 The present application does not meet the criteria of patentability, because the subject-matter of claims 4 and 6 is not new.
 - 2.1 D2 discloses in the wording of claim 1:
 - 2.2 Zwaarbelastbaar vuldeel (e.g. abstract: "similar density and sense of reality with natural hard wood") ,met het kenmerk, dat het vuldeel voorzien is als een composiet van bamboestrengen ("fibrous bamboo bunch") met een hars (second paragraph before "Fourth, illustration) en samengedrukt tot een dichtheid in het bereik van 1100 - 1200 kg/m³ (e.g. embodiment 1: 900-1100 kg/m³).
 - 2.3 D2 also discloses the features of claim 6, as the composite of D2 derived from a process as claimed, see the second paragraph before "Fourth, illustration").
- 3 The present application does not meet the criteria of patentability, because the subject-matter of claims 1-3, 5 does not involve an inventive step.
 - 3.1 D1, a publication of the applicant, may be regarded as being the prior art closest to the subject-matter of claim 1. It discloses the preamble of method claim 1, in particular it discloses the use of bamboo beams as stacking beams to support hydraulic jacks while pushing a heavy load upwards.

However, D1 does not disclose the particular density values of the bamboo composite of claim 1.

D1 already identifies the problem of using hardwoods of endangered tropical forests and suggests the usage of bamboo beams. The particular values of density claimed in claim 1 allegedly improve the composite so as to better withstand the high forces when lifting heavy loads, application page 1, lines 27-33.

The problem to be solved can thus be considered as improving the bamboo beams to better withstand high forces and thus be better suited for replacing hard wood.

D2 already strives to find a replacement for hardwood and suggests a composite of bamboo and resin pressed to a density of between 900-1100 kg/m³. The person skilled in the art seeking to replace natural hardwood would thus come across D2 and use a composite as disclosed in there to solve the problem posed.

Claim 1 is thus not inventive in view of D1 in combination with D2.

3.2 As D2 also discloses that the composite is press-manufactured claim 3 is equally not inventive (see above).

3.3 Claim 2 specifies the modulus of elasticity of the composite to be at least 1.6 kN/mm². D2 is silent about the elasticity of its bamboo beam. However, D3 discloses a similar bamboo beam with a modulus of elasticity of e.g. 6250-6450 kpsi, i.e. approximately 43-44 kN/mm², thus way above the value of 1.6 kN/mm² of claim 2. It is thus plausible that the elasticity of the beam of D2 has a similar elasticity value as the one of claim D3, but at least above the value claimed. Claim 2 is thus not inventive.

Claim 2 is thus not inventive in view of D1 and D2, considering that the beam of D2 already has the claimed property, as suggested by D3.

3.4 The same argumentation as for claim 2 also applies to claim 5. Claim 5 is not inventive in view of D2 and D3.
