

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

17 JAN 2019

Applicant's or agent's file reference

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT /TH18/00040

International filing date (day/month/year)

07 September 2018 (07.09.2018)

Priority date (day/month/year)

28 September 2017 (28.09.2017)

International Patent Classification (IPC) or both national classification and IPC

IPC - B29C 64/124, 64/135, 35/00; B33Y 30/00 (2018.01)

CPC -

B29C 64/124, 64/135, 35/00; B33Y 30/00; G03F 7/0037, 7/70416

Applicant **NATIONAL SCIENCE AND TECHNOLOGY DEVELOPMENT AGENCY**

1. 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 under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Date of completion of this opinion 16 December 2018 (16.12.2018)	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

the entire international application.

claims Nos. 11, 30, 32-33, 38-39

because:

the said international application, or the said claims Nos. _____ relate to the following subject matter which does not require an international search (*specify*):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 11, 30, 32-33, 38-39 are so unclear that no meaningful opinion could be formed (*specify*):

because claims 11, 30, 32-33, 38-39 are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

the claims, or said claims Nos. _____ are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

no international search report has been established for said claims Nos. 11, 30, 32-33, 38-39

a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13*ter*.1(a) or (b).

See Supplemental Box for further details.

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	***-Please See Below-***	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	***-Please See Below-***	NO
Industrial applicability (IA)	Claims	***-Please See Below-***	YES
	Claims	NONE	NO

2. Citations and explanations:

Novelty (N): YES: 1-2, 3/1-2, 4/3/1-2, 5/3/1-2, 6/5/3/1-2, 7/6/5/3/1-2, 8/7/6/5/3/1-2, 9/7/6/5/3/1-2, 10/7/6/5/3/1-2, 12/4/3/1-2, 13/12/4/1-2, 14/13/12/4/3/1-2, 15/13/12/4/3/1-2, 16/13/12/4/3/1-2, 17/13/12/4/1-2, 18/13/12/4/3/1-2, 19/12/4/3/1-2, 20/19/12/4/3/1-2, 21/19/12/4/3/1-2, 22/19/12/4/3/1-2, 23/19/12/4/3/1-2, 24/12/4/3/1-2, 25/24/12/4/3/1-2, 26/24/12/4/3/1-2, 27-28, 29/27-28, 31, 34-36, 37/35-36

Inventive step (IS): NO: 1-2, 3/1-2, 4/3/1-2, 5/3/1-2, 6/5/3/1-2, 7/6/5/3/1-2, 8/7/6/5/3/1-2, 9/7/6/5/3/1-2, 10/7/6/5/3/1-2, 12/4/3/1-2, 13/12/4/1-2, 14/13/12/4/3/1-2, 15/13/12/4/3/1-2, 16/13/12/4/3/1-2, 17/13/12/4/1-2, 18/13/12/4/3/1-2, 19/12/4/3/1-2, 20/19/12/4/3/1-2, 21/19/12/4/3/1-2, 22/19/12/4/3/1-2, 23/19/12/4/3/1-2, 24/12/4/3/1-2, 25/24/12/4/3/1-2, 26/24/12/4/3/1-2, 27-28, 29/27-28, 31, 34-36, 37/35-36

Industrial applicability (IA): YES: 1-2, 3/1-2, 4/3/1-2, 5/3/1-2, 6/5/3/1-2, 7/6/5/3/1-2, 8/7/6/5/3/1-2, 9/7/6/5/3/1-2, 10/7/6/5/3/1-2, 12/4/3/1-2, 13/12/4/1-2, 14/13/12/4/3/1-2, 15/13/12/4/3/1-2, 16/13/12/4/3/1-2, 17/13/12/4/1-2, 18/13/12/4/3/1-2, 19/12/4/3/1-2, 20/19/12/4/3/1-2, 21/19/12/4/3/1-2, 22/19/12/4/3/1-2, 23/19/12/4/3/1-2, 24/12/4/3/1-2, 25/24/12/4/3/1-2, 26/24/12/4/3/1-2, 27-28, 29/27-28, 31, 34-36, 37/35-36

Claims 1-2, 3/1-2, 4/3/1-2, 5/3/1-2, 6/5/3/1-2, 12/4/3/1-2, 13/12/4/3/1-2, 14/13/12/4/3/1-2, 27, and 31 lack an inventive step under PCT Article 33(3) as being over the document entitled "Effect of replacing carbon black with surfactant modified silica clay on mechanical properties of natural rubber composites" by Pinton, et al. (hereinafter 'Pinton') in view of US 2010/0304100 A1 (FONG).

As per claim 1, Pinton discloses (a) preparing prevulcanized natural rubber latex (composition comprising natural rubber, zinc oxide, sulfur, antioxidant, process oil and N-tert-butyl-2-benzothiazyl sulfonamide (accelerator), antioxidant, stearic acid, and filler; page 2, 3rd paragraph); (b) adding processing aid into the prevulcanized natural rubber latex for obtaining the mixture of prevulcanized natural rubber latex and processing aid (natural rubber composites comprising carbon black or surfactant modified silica clay; page 2, table 2a). Pinton does not disclose a method of forming a three-dimensional object, comprising (c) fabricating the mixture of prevulcanized natural rubber latex and processing aid to three-dimensional rubber articles by stereolithography (SLA) process. However, Fong discloses a method of forming a three-dimensional object (producing three dimensional articles; title), comprising fabricating a composition to three-dimensional rubber articles by stereolithography (SLA) process (photocurable composition for the production of a three-dimensional article by stereolithography having high clarity and providing cured three-dimensional shaped articles; paragraphs [0003], [0099]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, a method of forming a three-dimensional object, comprising (c) fabricating the mixture of prevulcanized natural rubber latex and processing aid to three-dimensional rubber articles by stereolithography (SLA) process, as disclosed by Fong, in order to provide three-dimensional articles having improved durability and properties.

As per claim 2, Pinton and Fong, in combination, disclose the method of claim 1, and Pinton further discloses wherein a composition for preparing prevulcanized natural rubber latex (natural rubber composites; page 2, 3rd paragraph; table 2a) comprising natural rubber latex (composition comprising natural rubber; page 2, 3rd paragraph) which has dry rubber content in the range of 30-60 wt. percent (composition comprising 100 phr natural rubber out of a total of 174.45 which correspond to 57 percent of natural rubber; page 2, 3rd paragraph).

As per claims 3/1-2, Pinton and Fong, in combination, disclose the method of claims 1-2, and Pinton further discloses wherein said preparing prevulcanized natural rubber latex is selected from sulfur prevulcanization system (natural rubber composites comprising 2.25 phr sulfur; page 2, 3rd paragraph).

-Continued Within the Next Supplemental Box-

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Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 1 and 37/35-36 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: Claims 1 and 37/35-36 recites period in the middle of the claim language. For the purpose of this analysis, as best understood, claims 1 and 37/35-36 are assumed to be in the proper form.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-Continued from Box V: Citations and Explanations-

As per claims 4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 3/1-2, but Pinton does not disclose wherein said irradiation prevulcanization system is selected from electron beam, gamma ray, ultraviolet wave, infrared wave, microwave, radio wave, and combination thereof. However, Fong discloses wherein said irradiation prevulcanization system is selected from ultraviolet wave (UV light; claim 20), microwave (microwave radiation; claim 20). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said irradiation prevulcanization system is selected from ultraviolet wave and microwave, as disclosed by Fong, in order to provide cured three-dimensional articles.

As per claims 5/3/1-2. Pinton and Fong, in combination, disclose the method of claims 3/1-2, and Pinton further discloses wherein a composition for preparing prevulcanized natural rubber latex in sulfur prevulcanization system (natural rubber composites; page 2, 3rd paragraph; table 2a) comprising natural rubber latex (100 phr natural rubber; page 2, 3rd paragraph), sulfur (2.25 phr sulfur; page 2, 3rd paragraph), zinc oxide (5 phr zinc oxide; page 2, 3rd paragraph), accelerators (0.65 phr N-tert-butyl-2-benzothiazyl sulfenamide (known accelerator in vulcanizing rubber); page 2, 3rd paragraph); page 2, 3rd paragraph), and antidegradants (1.25 phr antioxidant; page 2, 3rd paragraph).

As per claims 6/5/3/1-2, Pinton and Fong, in combination, disclose the method of claims 5/3/1-2, wherein a suitable composition for preparing prevulcanized natural rubber latex in sulfur prevulcanization system (natural rubber composites; page 2, 3rd paragraph; table 2a), comprising: a. natural rubber latex (100 phr natural rubber; page 2, 3rd paragraph), b. sulfur is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content (phr) (2.25 phr sulfur; page 2, 3rd paragraph), c. zinc oxide is in the range of 0.1- 5.0 phr (5 phr zinc oxide; page 2, 3rd paragraph), d. accelerator(s) is in the range of 0.1-3.0 phr (0.65 phr N-tert-butyl-2-benzothiazyl sulfenamide (known accelerator in vulcanizing rubber), and e. antidegradant(s) is in the range of 0.1-5.0 phr (1.25 phr antioxidant; page 2, 3rd paragraph).

As per claims 12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 4/3/1-2, wherein a composition for preparing the prevulcanized natural rubber latex (natural rubber composites; page 2, 3rd paragraph; table 2a), comprising; a. natural rubber latex (100 phr natural rubber; page 2, 3rd paragraph), c. coagent(s) is in the range of 0.1-5.0 phr (2.25 phr sulfur; page 2, 3rd paragraph), and d. antidegradant(s) is in the range of 0.1-5.0 phr (1.25 phr antioxidant; page 2, 3rd paragraph). Pinton does not disclose the irradiation via ultraviolet wave and initiator(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content (phr). However, Fong discloses the irradiation via ultraviolet wave (electromagnetic radiation employed is UV light; claim 20) and initiator(s) is in the range of 0.1-5.0 parts per 100 parts by weight of photocurable compound (free radical initiator in the photocurable composition is from about 0.01 to 10 percent by weight and photocurable compound is in the range of 35-80 percent by weight (thus, based on the amount of 35-80 percent by weight of photocurable compound, 0.01 to 10 percent of free radical initiator corresponds to 0.0035 to 8 phr); paragraphs [0008], [0069]-[0071]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, irradiation via ultraviolet wave and initiator(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content, in view of Fong, in order to provide three-dimensional articles having improved durability and properties.

As per claims 13/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 12/4/3/1-2, but Pinton does not disclose wherein said initiator(s) is selected from the group consisting of alpha-hydroxyketone, phenylglyoxylate, alpha-aminoketone, phosphine oxide, metallocene, benzophenone, and combination thereof. However, Fong discloses wherein said initiator(s) is selected from the group consisting of alpha-hydroxyketone (most preferable free radical photoinitiator is 1-hydroxycyclohexyl phenyl ketone; paragraph [0070]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said initiator(s) is selected from the group consisting of alpha-hydroxyketone, as disclosed by Fong, in order to cure the composites to provide three-dimensional articles having improved durability and properties.

As per claims 14/13/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 13/12/4/3/1-2, but Pinton does not disclose wherein said alpha-hydroxyketone is selected from the group consisting of 2-hydroxy-2-methyl-1-phenyl-1-propanone, 1-hydroxycyclohexyl phenyl ketone, and combination thereof. However, Fong discloses wherein said alpha-hydroxyketone is selected from the group consisting of 1-hydroxycyclohexyl phenyl ketone (most preferable free radical photoinitiator is 1-hydroxycyclohexyl phenyl ketone; paragraph [0070]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said alpha-hydroxyketone is selected from the group consisting of 1-hydroxycyclohexyl phenyl ketone, as disclosed by Fong, in order to cure the composites to provide three-dimensional articles having improved durability and properties.

As per claim 27, Pinton and Fong, in combination, disclose the method of claim 1, and Pinton further discloses wherein said processing aid is selected from the group consisting of carbon materials (carbon black; table 2a).

As per claim 31, Pinton and Fong, in combination, disclose the method of claim 27, and Pinton further discloses wherein said carbon material(s) is selected from the group consisting of carbon black (carbon black; table 2a).

-Continued Within the Next Supplemental Box-

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-Continued from Previous Supplemental Box-

Claims 1, and 35-36 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of US 6,103,176 A to Nguyen, et al. (hereinafter 'Nguyen').

As per claim 1, Pinton discloses (a) preparing pre-vulcanized natural rubber latex (composition comprising natural rubber, zinc oxide, sulfur, antioxidant, process oil and N-tert-butyl-2-benzothiazyl sulfonamide (accelerator), antioxidant, stearic acid, and filler; page 2, 3rd paragraph); (b) adding processing aid into the pre-vulcanized natural rubber latex for obtaining the mixture of pre-vulcanized natural rubber latex and processing aid (natural rubber composites comprising carbon black or surfactant modified silica clay; page 2, table 2a). Pinton does not disclose a method of forming a three-dimensional object, comprising (c) fabricating the mixture of pre-vulcanized natural rubber latex and processing aid to three-dimensional rubber articles by stereolithography (SLA) process. However, Nguyen discloses a method of forming a three-dimensional object (stereolithographic method and apparatus for production of three dimensional objects; title; abstract), comprising fabricating a composition to three-dimensional rubber articles by stereolithography (SLA) process (rapid prototyping and stereolithography method and apparatus for making three dimensional objects, from photopolymers; abstract, column 11, lines 44-46). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, a method of forming a three-dimensional object, comprising (c) fabricating the mixture of pre-vulcanized natural rubber latex and processing aid to three-dimensional rubber articles by stereolithography (SLA) process, as disclosed by Nguyen, in order to provide three-dimensional articles having improved durability and properties.

As per claim 35, Pinton and Nguyen, in combination, disclose the method of claim 1, and Pinton further discloses mixture of pre-vulcanized natural rubber latex and processing aid (natural rubber composites comprising carbon black or surfactant modified silica clay; page 2, 3rd paragraph; table 2a). Pinton does not disclose wherein said fabricating of three-dimensional rubber articles of stereolithography (SLA) process comprising the steps of; (i) creating a 50 - 500 micrometer thick layer on a substrate or a previous layer, (ii) irradiating the layer of the mixture of pre-vulcanized natural rubber latex and processing aid with laser beam, and (iii) repeating the i) - ii) steps until the three-dimensional article is completed. However, Nguyen discloses wherein said fabricating of three-dimensional rubber articles of stereolithography (SLA) process (stereolithographic method and apparatus for production of three dimensional objects; title; abstract) comprising the steps of; (i) creating a 50 - 500 micrometer thick layer of the mixture (thickness of each layer is from 4 mils to 10 mils (100 to 254 micrometer); column 11, lines 39-40) on a substrate or a previous layer (SLA involves alternating formation of coatings of material (i.e. layers of material) and the selective solidification of those coatings to form an object from a plurality of adhered laminae; column 11, lines 19-22), (ii) irradiating the layer of the mixture of pre-vulcanized natural rubber latex and processing aid with laser beam (coating of photo polymer is exposed to prescribed stimulation (e.g. a beam of UV radiation) which cures the material to a desired depth to form an initial lamina of the object adhered to the elevator platform; column 11, lines 25-29), and (iii) repeating the i) - ii) steps until the three-dimensional article is completed (after formation of the coating, a second layer is solidified by a second exposure of the material to prescribed stimulation according to data representing a second cross-section of the object, and this process of coating formation and solidification is repeated over and over again until the object is formed from a plurality of adhered layers; column 11, lines 48-54). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said fabricating of three-dimensional rubber articles of stereolithography (SLA) process comprising the steps of; (i) creating a 50 - 500 micrometer thick layer on a substrate or a previous layer, (ii) irradiating the layer of the mixture of pre-vulcanized natural rubber latex and processing aid with laser beam, and (iii) repeating the i) - ii) steps until the three-dimensional article is completed, as disclosed by Nguyen, in order to provide in order to provide three-dimensional articles having improved durability and properties.

As per claim 36, Pinton and Nguyen, in combination, disclose the method of claim 35, but Pinton does not disclose wherein a laser wavelength is in the ranges of 200 - 450 nm (ultraviolet range) or 700 nm-1 mm (infrared range). However, Nguyen discloses wherein a laser wavelength is in the ranges of 200 - 450 nm (ultraviolet range) (SLA-250 system using a CW HeCd laser operating at 325 nm, the SLA-3500, SLA-5000, and the SLA 7000 system using a solid state lasers operating at 355 nm; column 11, lines 11-13). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein a laser wavelength is in the ranges of 200 - 450 nm (ultraviolet range), as disclosed by Nguyen, in order to provide cured three-dimensional articles having improved durability and properties.

Claims 7/6/5/3/1-2, 8/7/6/5/3/1-2, and 9/7/6/5/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 4,012,332 A (BEHRENS).

As per claims 7/6/5/3/1-2, Pinton and Fong, in combination, disclose the method of claims 6/5/3/1-2, but Pinton does not disclose wherein said accelerator(s) is selected from the group consisting of dithiocarbamates, thiurams, guanidines, and combination thereof. However, Behrens discloses wherein said accelerator(s) is selected from the group consisting of dithiocarbamates, thiurams, and guanidines (accelerators most commonly used as activators are the thiuram sulfides, dithiocarbamates and guanidines; column 1, lines 39-41; column 2, lines 44-57). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said accelerator(s) is selected from the group consisting of dithiocarbamates, thiurams, guanidines, and combination thereof, as disclosed by Behrens, in order to provide vulcanized rubber composites.

-Continued Within the Next Supplemental Box-

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-***-Continued from Previous Supplemental Box-***-

As per claims 8/7/6/5/3/1-2, Pinton and Fong, in combination, disclose the method of claims 7/6/5/3/1-2, but Pinton does not disclose wherein said dithiocarbamate(s) is selected from the group consisting of zinc dimethyldithiocarbamate, zinc diethyldithiocarbamate, zinc dibenzylidithiocarbamate; and combination thereof. However, Behrens discloses wherein said dithiocarbamate(s) is selected from the group consisting of zinc dimethyldithiocarbamate (zinc dimethyldithiocarbamate; column 2, lines 55-57) and zinc diethyldithiocarbamate (zinc diethyldithiocarbamate; column 2, lines 55-57). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said dithiocarbamate(s) is selected from the group consisting of zinc dimethyldithiocarbamate and zinc diethyldithiocarbamate as disclosed by Behrens, in order to provide vulcanized rubber composites.

As per claims 9/7/6/5/3/1-2, Pinton and Fong, in combination, disclose the method of claims 7/6/5/3/1-2, but Pinton does not disclose wherein said thiuram(s) is selected from the group consisting of tetramethyl thiuram monosulphide, tetramethyl thiuram disulphide, tetraethyl thiuram disulphide, and combination thereof. However, Behrens discloses wherein said thiuram(s) (thiuram sulfide accelerators; column 2, lines 37-42) is selected from the group consisting of tetramethyl thiuram monosulphide (tetramethyl thiuram monodisulfide; column 2, lines 37-38; tables 1, 3-4), tetramethyl thiuram disulphide (tetraethyl thiuram disulfide; column 2, lines 37-38; table 4), tetraethyl thiuram disulphide (tetraethyl thiuram disulphide; table 4), and combination thereof (tetramethyl thiuram monodisulfide, tetramethyl thiuram disulfide, tetraethyl thiuram disulphide; table 4). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said thiuram(s) is selected from the group consisting of tetramethyl thiuram monosulphide, tetramethyl thiuram disulphide, tetraethyl thiuram disulphide, and combination thereof, as disclosed by Behrens, in order to provide vulcanized rubber composites.

Claims 7/6/5/3/1-2 and 10/7/6/5/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 2,288,779 A to Bradley, et al. (hereinafter 'Bradley').

As per claims 7/6/5/3/1-2, Pinton and Fong, in combination, disclose the method of claims 6/5/3/1-2, but Pinton does not disclose wherein said accelerator(s) is selected from the group consisting of dithiocarbamates, thiurams, guanidines, and combination thereof. However, Bradley discloses wherein said accelerator(s) is selected from the group consisting of guanidines (accelerators of the vulcanization of rubber include diaryl guanidines, such, for example, as diphenyl guanidine, di-ortho-tolyl guanidine, phenyl-ortho-tolyl guanidine and the like; column 1, lines 5-16). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said accelerator(s) is selected from the group consisting of guanidines, as disclosed by Bradley, in order to provide vulcanized rubber composites.

As per claims 10/7/6/5/3/1-2, Pinton and Fong, in combination, disclose the method of claims 7/6/5/3/1-2, but Pinton does not disclose wherein said guanidine(s) is selected from the group consisting of diphenyl guanidine, di-o-tolyl guanidine, and combination thereof. However, Bradley discloses wherein said guanidine(s) is selected from the group consisting of diphenyl guanidine (accelerators of the vulcanization of rubber include diaryl guanidines, such, for example, as diphenyl guanidine, di-ortho-tolyl guanidine, phenyl-ortho-tolyl guanidine and the like; column 1, lines 5-16) and di-o-tolyl guanidine (accelerators of the vulcanization of rubber include diaryl guanidines, such, for example, as diphenyl guanidine, di-ortho-tolyl guanidine, phenyl-ortho-tolyl guanidine and the like; column 1, lines 5-16). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said guanidine(s) is selected from the group consisting of diphenyl guanidine and di-o-tolyl guanidine, as disclosed by Bradley, in order to provide vulcanized rubber composites.

Claims 15/13/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 2014/0350237 A1 to Stematters, Biotechnologia E Medicina Regenerativa SA (hereinafter 'Stematters').

As per claims 15/13/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 13/12/4/3/1-2, but Pinton does not disclose wherein said phenylglyoxylate is selected from the group consisting of methyl benzoylformate, oxy-phenyl-acetic 2-[2-hydroxy-ethoxy]-ethyl ester, and combination thereof. However, Stematters discloses wherein said phenylglyoxylate is selected from the group consisting of methyl benzoylformate (photo-initiator could be methylbenzoyl formate; paragraph [0027]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said phenylglyoxylate is selected from the group consisting of methyl benzoylformate, as disclosed by Stematters, in order to cure the composites to provide three-dimensional articles having improved durability and properties.

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Claims 16/13/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of WO 2009/147033 A1 to BASF SE (hereinafter 'BASF').

As per claims 16/13/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 13/12/4/3/1-2, but Pinton does not disclose wherein said alpha-aminoketone is selected from the group consisting of 2-benzyl-2-(dimethylamino)-1-[4-(4-morpholinyl)phenyl]-1-butanone, 2-methyl-1-(4-(methylthio)phenyl)-2-(4-morpholinyl)-1-propanone, and combination thereof. However, BASF discloses wherein said alpha-aminoketone is selected from the group consisting of 2-benzyl-2-(dimethylamino)-1-[4-(4-morpholinyl)phenyl]-1-butanone (photoinitiator mixtures comprising alpha-amino ketones for their use as photoinitiators in photopolymerizable compositions where specifically preferred alphaamino compound is 2-benzyl-2-(dimethylamino)-1-[4-(4-morpholinyl)phenyl]-1-butanone; page 1 lines 1-2; page 18, lines 3-4). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said alpha-aminoketone is selected from the group consisting of 2-benzyl-2-(dimethylamino)-1-[4-(4-morpholinyl)phenyl]-1-butanone, as disclosed by BASF, in order to provide photo-curable crosslinkers useful for manufacturing three-dimensional articles having improved durability and properties.

Claims 17/13/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of CN 104910207 A to Tianjin Mosen Technology Co Ltd (hereinafter 'Tianjin').

As per claims 17/13/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 13/12/4/3/1-2, but Pinton does not disclose wherein said phosphine oxide(s) is selected from the group consisting of diphenyl (2,4,6-trimethylbenzoyl)-phosphine oxide, dimethyl (phenyl)phosphine oxide, butyl(diphenyl)-phosphine oxide, and combination thereof. However, Tianjin discloses wherein said phosphine oxide(s) is selected from the group consisting of diphenyl (2,4,6-trimethylbenzoyl)-phosphine oxide ((2,4,6-trimethylbenzoyl) diphenyl phosphine oxide for use in the radiation polymerization curing; abstract). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said phosphine oxide(s) is selected from the group consisting of diphenyl (2,4,6-trimethylbenzoyl)-phosphine oxide, as disclosed by Tianjin, in order to cure the composites to provide three-dimensional articles having improved durability and properties.

Claims 18/13/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of EP 1,153,905 B1 to Autex, Inc. (hereinafter "Autex").

As per claims 18/13/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 13/12/4/3/1-2, but Pinton does not disclose wherein said metallocene(s) is selected from the group consisting of titanocenes, ferrocenes, zirconocenes, and combination thereof. However, Autex discloses wherein said metallocene(s) is selected from the group consisting of ferrocenes (photopolymerization initiator is salt of metallocene complex, where the metallocene derivative cation is ferrocenium (cation of ferrocene); paragraphs [0008], [0028]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said metallocene(s) is selected from the group consisting of ferrocenes, as disclosed by Autex, in order to cure the composites to provide three-dimensional articles having improved durability and properties.

Claims 19/12/4/3/1-2, 20/19/12/4/3/1-2, 22/19/12/4/3/1-2, and 23/19/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 4,218,294 A (BRACK).

As per claims 19/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 12/4/3/1-2, but Pinton does not disclose wherein said coagent(s) is selected from the group consisting of mono-functional groups, di-functional groups, tri-functional groups, multi-functional groups, and combination thereof. However, Brack discloses wherein said coagent(s) (radiation curable prepolymer material; claim 3) is selected from the group consisting of mono-functional groups (acrylate; claim 3), di-functional groups (diacrylate; claim 3), tri-functional groups (triacrylate; claim 3), multi-functional groups (tetraacrylate; claim 3), and combination thereof (mixtures thereof; claim 3). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said coagent(s) is selected from the group consisting of mono-functional groups, di-functional groups, tri-functional groups, multi-functional groups, and combination thereof, as disclosed by Brack, in order to cure the composites by crosslinking technology to provide three-dimensional articles having improved durability and properties.

As per claims 20/19/12/4/3/1-2, Pinton, Fong, and Brack, in combination, disclose the method of claim 19/12/4/3/1-2, but Pinton does not disclose wherein said mono-functional groups are selected from the group consisting of normal-butyl acrylate, methyl methacrylate, phenoxy ethyl acrylate, hydroxyethyl methacrylate, phenoxy polyethylene glycol acrylate, and combination thereof. However, Brack discloses wherein said mono-functional groups are selected from the group consisting of normal-butyl acrylate (said acrylate or methacrylate monomers are selected from the group consisting of butyl acrylate; claim 3) and hydroxyethyl methacrylate (2-hydroxyethyl acrylate or the corresponding methacrylate; column 29, lines 5-6; claim 3), and combination thereof (mixtures thereof; claim 3). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said mono-functional groups are selected from the group consisting of normal-butyl acrylate and hydroxyethyl methacrylate, and combination thereof, as disclosed by Brack, in order to cure the composites by crosslinking technology to provide three-dimensional articles having improved durability and properties.

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As per claims 22/19/12/4/3/1-2, Pinton, Fong, and Brack, in combination, disclose the method of claim 19, but Pinton does not disclose wherein said tri-functional groups are selected from the group consisting of trimethylol propane triacrylate, trimethylol propane trimethacrylate, triallyl cyanurate, and combination thereof. However, Brack discloses wherein said tri-functional groups are selected from the group consisting of trimethylol propane triacrylate (trimethylolpropane triacrylate; column 4, lines 38-40; column 29, lines 4-5). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said tri-functional groups are selected from the group consisting of trimethylol propane triacrylate, as disclosed by Brack, in order to cure the composites by crosslinking technology to provide three-dimensional articles having improved durability and properties.

As per claims 23/19/12/4/3/1-2, Pinton, Fong, and Brack, in combination, disclose the method of claims 19/12/4/3/1-2, but Pinton does not disclose wherein said multi-functional groups are selected from the group consisting of tetramethylol methane tetraacrylate, pentaerythritol teraacrylate, and combination thereof. However, Brack discloses wherein said multi-functional groups are selected from the group consisting of pentaerythritol teraacrylate (composition comprising pentaerythritol teraacrylate; column 14, lines 10-11). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said multi-functional groups are selected from the group consisting of pentaerythritol teraacrylate, as disclosed by Brack, in order to cure the composites by crosslinking technology to provide three-dimensional articles having improved durability and properties.

Claims 19/12/4/3/1-2 and 21/19/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 3,933,754 A Kitagawa, et al. (hereinafter 'Kitagawa').

As per claims 19/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 12/4/3/1-2, but Pinton does not disclose wherein said coagent(s) is selected from the group consisting of mono-functional groups, di-functional groups, tri-functional groups, multi-functional groups, and combination thereof. However, Kitagawa discloses wherein said coagent(s) (crosslinking agent in polymerization; claim 1) is selected from the group consisting of di-functional groups (crosslinking agent is ethylene glycol dimethacrylate, trimethylene glycol dimethacrylate, tetramethylene glycol dimethacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, or tetraethylene glycol dimethacrylate; claims 2-7). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said coagent(s) is selected from the group consisting of di-functional groups, as disclosed by Kitagawa, in order to cure the composites by crosslinking technology to provide three-dimensional articles having improved durability and properties.

As per claims 21/19/12/4/3/1-2, Pinton, Fong, and Kitagawa, in combination, disclose the method of claims 19/12/4/3/1-2, but Pinton does not disclose wherein said di-functional groups are selected from the group consisting of 1,9-nonanediol diacrylate, dimethylamino ethyl methacrylate, trimethylene glycol dimethacrylate, and combination thereof. However, Kitagawa discloses wherein said di-functional groups are selected from the group consisting of trimethylene glycol dimethacrylate (triethylene glycol dimethacrylate; claim 6). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said di-functional groups are selected from the group consisting of trimethylene glycol dimethacrylate, as disclosed by Kitagawa, in order to cure the composites by crosslinking technology to provide three-dimensional articles having improved durability and properties.

Claims 24/12/4/3/1-2 and 25/24/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 3,244,683 A to Kline, et al. (hereinafter 'Kline').

As per claims 24/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 12/4/3/1-2, but Pinton does not disclose wherein said antidegradant(s) is selected from the group consisting of amine derivatives, phenol derivatives, and combination thereof. However, Kline discloses wherein said antidegradant(s) is selected from the group consisting of amine derivatives (rubber antioxidants comprising 2,2,4-trimethyl-1,2-dihydroquinoline; claims 1-2). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said antidegradant(s) is selected from the group consisting of amine derivatives, as disclosed by Kline, in order to provide three-dimensional articles having improved durability and properties.

As per claims 25/24/12/4/3/1-2, Pinton, Fong, and Kline, in combination, disclose the method of claims 24/12/4/3/1-2, but Pinton does not disclose wherein said amine derivative(s) is selected from the group consisting of N-isopropyl-N'-phenyl-p-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine, 2,2,4-trimethyl-1,2-dihydroquinoline, and combination thereof. However, Kline discloses wherein said amine derivative(s) is selected from the group consisting of 2,2,4-trimethyl-1,2-dihydroquinoline (rubber antioxidants comprising 2,2,4-trimethyl-1,2-dihydroquinoline; claims 1-2). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said amine derivative(s) is selected from the group consisting of 2,2,4-trimethyl-1,2-dihydroquinoline, as disclosed by Kline, in order to provide three-dimensional articles having improved durability and properties.

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Claims 24/12/4/3/1-2 and 26/24/12/4/3/1-2 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 7,342,070 B2 to Tsukimawashi et al. (hereinafter 'Tsukimawashi').

As per claims 24/12/4/3/1-2, Pinton and Fong, in combination, disclose the method of claims 12/4/3/1-2, but Pinton does not disclose wherein said antidegradant(s) is selected from the group consisting of amine derivatives, phenol derivatives, and combination thereof. However, Tsukimawashi discloses wherein said antidegradant(s) is selected from the group consisting of phenol derivatives (antioxidant added during production or after production, and adding 2,6-di-tert-butyl-p-cresol was added to the polymer solution after reaction; column 11, lines 55-56; column 41, lines 19-20; column 42, lines 18-19). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said antidegradant(s) is selected from the group consisting of phenol derivatives, as disclosed by Tsukimawashi, in order to provide three-dimensional articles having improved durability and properties.

As per claims 26/24/12/4/3/1-2, Pinton, Fong, and Tsukimawashi, in combination, disclose the method of claims 24/12/4/3/1-2, but Pinton does not disclose wherein said phenol derivative(s) is selected from the group consisting of 2,6-di-tert-butyl-p-cresol, poly (dicyclopentadiene-co-p-cresol), 4,4'-butylidene-bis-(2-tert-arylbutyl-5-methylphenol), and combination thereof. However, Tsukimawashi discloses wherein said phenol derivative(s) is selected from the group consisting of 2,6-di-tert-butyl-p-cresol (antioxidant added during production or after production, and adding 2,6-di-tert-butyl-p-cresol was added to the rubber polymer solution after reaction; column 11, lines 55-56; column 41, lines 19-20; column 42, lines 18-19). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said phenol derivative(s) is selected from the group consisting of 2,6-di-tert-butyl-p-cresol, as disclosed by Tsukimawashi, in order to provide three-dimensional articles having improved durability and properties.

Claims 28 and 29/27-28 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong in further in view of US 2,598,127 A to Keckler, et al. (hereinafter 'Keckler').

As per claim 28, Pinton and Fong, in combination, disclose the method of claim 27, but Pinton does not disclose wherein said heat sensitive polymer(s) is selected from the group consisting of a poly(N-isopropylacrylamide), poly(N-acryloyl glycinamide), poly [2-(dimethylamino)ethyl methacrylate], polyhydroxyethylmethacrylate, polyethylene oxide, hydroxypropylcellulose, poly (vinylcaprolactam), polyvinyl methyl ether, poly(Nvinylimidazole-co-l-vinyl-2-(hydroxymethyl)imidazole), poly (acrylonitrile-coacrylamide), and combination thereof. However, Keckler discloses wherein said heat sensitive polymer(s) is selected from the group consisting of polyvinyl methyl ether (latex composition comprising polyvinyl methyl ether; column 5, lines 13-40). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said heat sensitive polymer(s) is selected from the group consisting of polyvinyl methyl ether, as disclosed by Keckler, in order to provide latex compositions useful for preparing articles.

As per claims 29/27, Pinton and Fong, in combination, disclose the method of claim 27, but Pinton does not disclose wherein an amount of said heat sensitive polymer(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content. However, Keckler discloses wherein an amount of said heat sensitive polymer(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content (25 percent polyvinyl methyl ether in an amount of 16 parts by weight of 148 parts rubber content (thus, for 100 parts of rubber this corresponds to 10.8 parts of 25 percent polyvinyl methyl ether which is equivalent to 2.7 parts by weight of dry rubber content); column 5, lines 13-40). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein an amount of said heat sensitive polymer(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content, as disclosed by Keckler, in order to provide latex compositions useful for preparing articles.

As per claims 29/28, Pinton, Fong, and Keckler, in combination, disclose the method of claim 28, but Pinton does not disclose wherein an amount of said heat sensitive polymer(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content. However, Keckler discloses wherein an amount of said heat sensitive polymer(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content (25 percent polyvinyl methyl ether in an amount of 16 parts by weight of 148 parts rubber content (thus, for 100 parts of rubber this corresponds to 10.8 parts of 25 percent polyvinyl methyl ether which is equivalent to 2.7 parts by weight of dry rubber content); column 5, lines 13-40). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein an amount of said heat sensitive polymer(s) is in the range of 0.1-5.0 parts per 100 parts by weight of dry rubber content, as disclosed by Keckler, in order to provide latex compositions useful for preparing articles.

Claim 34 lacks an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Fong WO 2009/025675 A1 to Yulex Corporation (hereinafter 'Yulex').

As per claim 34, Pinton and Fong, in combination, disclose the method of claim 1, but Pinton does not disclose wherein said pre vulcanized natural rubber latex having a chloroform number in the range of 3-4 and/or a swelling index of more than 85 percent. However, Yulex discloses wherein said pre vulcanized natural rubber latex having a swelling index of more than 85 percent (natural rubber latex have a swell index ranged from 102-172 percent; paragraph [0052]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said pre vulcanized natural rubber latex having a swelling index of more than 85 percent, as disclosed by Yulex, in order to provide latex compositions having good mechanical strength for preparing articles.

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Claims 37/35-36 lack an inventive step under PCT Article 33(3) as being obvious over Pinton in view of Nguyen in further in view of EP 2,784,045 A1 to Osseomatrix (hereinafter 'Osseomatrix').

As per claims 37/35-36, Pinton and Nguyen, in combination, disclose the method of claims 35-36, but Pinton does not disclose wherein said irradiating has suitable parameters; (i) pulse frequency of the laser is in the range of 20 - 100 kHz; (ii) scan speed of the laser is in the range of 50 - 200 mm/s; (iii) hatch space of the laser is in the range of 100 - 300 micrometers; (iv) power density of the laser in the range of 70- 250 W/cm². However, Nguyen discloses wherein said irradiating (coating of photo polymer is exposed to prescribed stimulation (e.g. a beam of UV radiation) which cures the material to a desired depth to form an initial lamina of the object adhered to the elevator platform; column 11, lines 25-29) has suitable parameters; (i) pulse frequency of the laser is in the range of 20-100 kHz (stereolithography systems having pulse repetition rates of 22.2 KHz, 40 KHz, and 25 KHz, respectively; column 11, lines 14-15); (ii) scan speed of the laser is in the range of 50-200 mm/s (sweeping speed of 2 inches/sec (50.8 mm/sec); table 3). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pinton to provide, wherein said irradiating has suitable parameters; (i) pulse frequency of the laser is in the range of 20-100 kHz; (ii) scan speed of the laser is in the range of 50-200 mm/s, as disclosed by Nguyen, in order to provide cured three-dimensional articles having improved durability and properties. Osseomatrix discloses (iii) hatch space of the laser is in the range of 100-300 micrometer (layer manufacturing process is performed thanks to at least one energy source, for example at least one laser, and hatching space may range from 1 to 1000 micrometers, preferably from 10 to 500 micrometers, more preferably from 100 to 300 micrometers; paragraphs [0058], [0065]); and (iv) power density of the laser in the range of 70-250 W/cm² (power of the energy source used during the manufacturing process ranges from 1 to 500 Watts, preferably from 5 to 300 Watts, more preferably from 10 to 150 Watts per unit area (density); paragraph [0063]). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify to provide, hatch space of the laser is in the range of 100-300 and power density of the laser in the range of 70-250 W/cm² as disclosed by Osseomatrix, in order to provide cured three-dimensional articles having improved durability and properties.

Claims 1-2, 3/1-2, 4/3/1-2, 5/3/1-2, 6/5/3/1-2, 7/6/5/3/1-2, 8/7/6/5/3/1-2, 9/7/6/5/3/1-2, 10/7/6/5/3/1-2, 12/4/3/1-2, 13/12/4/1-2, 14/13/12/4/3/1-2, 15/13/12/4/3/1-2, 16/13/12/4/3/1-2, 17/13/12/4/1-2, 18/13/12/4/3/1-2, 19/12/4/3/1-2, 20/19/12/4/3/1-2, 21/19/12/4/3/1-2, 22/19/12/4/3/1-2, 23/19/12/4/3/1-2, 24/12/4/3/1-2, 25/24/12/4/3/1-2, 26/24/12/4/3/1-2, 27-28, 29/27-28, 31, 34-36, 37/35-36 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.