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UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	22773-826.311
	First Named Inventor	Chunhua LI, et al.
	Title	MULTILAYER POLYMER SHEETS
	Priority Mail Express® Label No.	

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450
1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☐ Applicant asserts small entity status. See 37 CFR 1.27 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>17</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement) 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>8</u>] 6. ☒ Inventor's Oath or Declaration [Total Pages <u>6</u>] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e)) a. ☐ Newly executed (original or copy) b. ☒ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD 9. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. – c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☒ 37 CFR 3.73(c) Statement ☒ Power of Attorney (when there is an assignee) 12. ☐ English Translation Document (if applicable) 13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 14. ☐ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☒ Other: Certification and Request for Prioritized Examination Under 37 CFR 1.102(e) - Track 1 _____ _____ _____ _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS					
☒ The address associated with Customer Number: <u>107046</u> OR ☐ Correspondence address below					
Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	
Signature	/Garrett T. Potter/			Date	September 2, 2022
Name (Print/Type)	Garrett T. POTTER			Registration No. (Attorney/Agent)	76,602

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

**CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION
UNDER 37 CFR 1.102(e) (Page 1 of 1)**

First Named Inventor:	Chunhua LI, et al.	Nonprovisional Application Number (if known):	
Title of Invention:	MULTILAYER POLYMER SHEETS		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently \$0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.
2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.
3. The applicable box is checked below:

I. ☒ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

- i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.
---OR---
(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.
- ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, or the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

- i. A request for continued examination has been filed with, or prior to, this form.
- ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
- iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
- iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
- v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature <u>/Garrett T. Potter/</u>	Date <u>September 2, 2022</u>
Name (Print/Typed) <u>Garrett T. POTTER</u>	Practitioner Registration Number <u>76,602</u>
Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.*	
☐ *Total of _____ forms are submitted.	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1		Remove	
Legal Name			
Prefix	Given Name	Middle Name	Family Name
	Chunhua		LI
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service			
City	Cupertino	State/Province	CA
		Country of Residence	US
Mailing Address of Inventor:			
Address 1		19688 Vicksburg Drive	
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US
Inventor 2		Remove	
Legal Name			
Prefix	Given Name	Middle Name	Family Name
	Yan		CHEN
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service			
City	Cupertino	State/Province	CA
		Country of Residence	US
Mailing Address of Inventor:			
Address 1		10461 Pineville Avenue	
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US
Inventor 3		Remove	
Legal Name			
Prefix	Given Name	Middle Name	Family Name
	Heinz		PUDLEINER
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service			

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

City	Krefeld	Country of Residence ⁱ	DE
------	---------	-----------------------------------	----

Mailing Address of Inventor:

Address 1	Bethelstr, 39			
Address 2				
City	Krefeld	State/Province		
Postal Code	47800	Country ⁱ	DE	
Inventor	4	Remove		
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Klaus		MEYER	

Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service

City	Dormagen	Country of Residence ⁱ	DE
------	----------	-----------------------------------	----

Mailing Address of Inventor:

Address 1	Kamillenstr, 40			
Address 2				
City	Dormagen	State/Province		
Postal Code	41539	Country ⁱ	DE	
Inventor	5	Remove		
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Joerg		NICKEL	

Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service

City	Dormagen	Country of Residence ⁱ	DE
------	----------	-----------------------------------	----

Mailing Address of Inventor:

Address 1	Krokusweg 2			
Address 2				
City	Dormagen	State/Province		
Postal Code	41539	Country ⁱ	DE	
Inventor	6	Remove		
Legal Name				

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

Prefix	Given Name	Middle Name	Family Name	Suffix	
	Craig		PEHLERT		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Lenox	State/Province	MA	Country of Residence	US
Mailing Address of Inventor:					
Address 1	29 St. Ann's Avenue				
Address 2					
City	Lenox	State/Province	MA		
Postal Code	01240	Country i	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					
				Add	

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	107046		
Email Address	patentdocket@wsgr.com	Add Email	Remove Email

Application Information:

Title of the Invention	MULTILAYER POLYMER SHEETS		
Attorney Docket Number	22773-826.311	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐	Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:			
☒	Customer Number	☐	US Patent Practitioner
☐	Limited Recognition (37 CFR 11.9)		
Customer Number	107046		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove			
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
	Continuation of	17/858825	2022-07-06		
Prior Application Status	Pending	Remove			
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
17/858825	Continuation of	17/553590	2021-12-16		
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17/553590	Continuation of	16/835101	2020-03-30	11213369	2022-01-04
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/835101	Continuation of	15/476655	2017-03-31	10973613	2021-04-13

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		22773-826.311	
		Application Number			
Title of Invention	MULTILAYER POLYMER SHEETS				
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/476655	Division of	13/470681	2012-05-14	9655691	2017-05-23
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.					Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. ☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant 1		Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
● Assignee		Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	ALIGN TECHNOLOGY, INC.		
Mailing Address Information For Applicant:			
Address 1	2820 Orchard Parkway		
Address 2			
City	San Jose	State/Province	CA
Country	US	Postal Code	95134
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature: [Remove](#)

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Garrett Potter/		Date (YYYY-MM-DD)	2022-09-02	
First Name	Garrett	Last Name	POTTER	Registration Number	76,602
Additional Signature may be generated within this form by selecting the Add button. Add					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	22773-826.311
		Application Number	
Title of Invention	MULTILAYER POLYMER SHEETS		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT APPLICATION

MULTILAYER POLYMER SHEETS

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MULTILAYER POLYMER SHEETS

CROSS-REFERENCE

[0001] This application is a continuation of U.S. Patent Application No. 17/858,825, filed July 6, 2022, which is a continuation of U.S. Patent Application No. 17/553,590, filed December 16, 2021, which is a continuation of U.S. Patent Application No. 16/835,101, filed March 30, 2020, now U.S. Patent No. 11,213,369, issued January 4, 2022, which is a continuation of U.S. Patent Application No. 15/476,655, filed March 31, 2017, now U.S. Patent No. 10,973,613, issued April 13, 2021, which is a divisional of U.S. Patent Application No. 13/470,681, filed May 14, 2012, now U.S. Patent No. 9,655,691 issued May 23, 2017, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention generally relates to the field of orthodontics, and more particularly to the design of multilayer dental positioning appliances.

[0003] An objective of orthodontics is to move a patient's teeth to positions where function and/or aesthetics are optimized. Traditionally, appliances such as braces are applied to a patient's teeth by a treating practitioner and the set of braces exerts continual force on the teeth and gradually urges them toward their intended positions. Over time and with a series of clinical visits and reactive adjustments to the braces by the practitioner, the appliances to move the teeth toward their final destination.

[0004] More recently, alternatives to conventional orthodontic treatment with traditional affixed appliances (*e.g.*, braces) have become available. For example, systems including a series of preformed appliances/aligners have become commercially available from Align Technology, Inc., San Jose, CA, under the trade name Invisalign® System. The Invisalign® System is described in numerous patents and patent applications assigned to Align Technology, Inc. including, for example in U.S. Pat. Nos. 6,450,807, and 5,975,893, as well as on the company's website, which is accessible on the World Wide Web (see, *e.g.*, the url invisalign.com). The Invisalign® System includes designing and/or fabricating multiple, and sometimes all, of the aligners to be worn by the patient before the aligners are administered to the patient and used to reposition the teeth (*e.g.*, at the outset of treatment). Often, designing and planning a customized treatment for a patient makes use of computer-based 3-dimensional planning/design tools, such as Treat™ software from Align Technology, Inc. The design of the aligners relies on computer modeling of the patient's teeth in a series of planned successive tooth arrangements, and the individual aligners are designed to be worn over the teeth, such that each

aligner exerts force on the teeth and elastically repositions the teeth to each of the planned tooth arrangements.

[0005] While recently developed orthodontic treatment technologies, such as those described above, represent a considerable advancement in the field of orthodontics, additional advancements remain of interest. For example, in some instances it may be advantageous to develop materials that improve properties of the appliances/aligners used for orthodontic treatment. As such, there is a need for shell aligners that can, for example, produce more continuous force and better bring a patient's teeth into a desired occlusion.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention provides multilayer orthodontic positioning appliances, as well as related methods and systems. The disclosed multilayer appliances include a removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of the patient's teeth and apply a resilient positioning force to the patient's teeth. The multilayer appliances can include a hard polymer layer disposed between two soft polymer layers. The multilayer dental appliances of the present invention, among many aspects, provide, for example, improved material performance, stress relaxation properties and longer working range. In addition, the mechanical properties of the materials and appliances described herein can improve orthodontic treatments by, for example, reducing the need for midcourse corrections during treatment and the number of aligners used for a given treatment.

[0007] The disclosed methods include methods for making multilayer dental appliances. The disclosed systems including a plurality of appliances having teeth receiving cavities shaped to directly receive at least some of the patient's teeth and apply a resilient positioning force to the patient's teeth. The appliances can be successively worn by a patient to move teeth from one arrangement to a successive arrangement. At least one of the appliances in the system can include a hard polymer layer disposed between two soft polymer layers.

[0008] For a fuller understanding of the nature and advantages of the present invention, reference should be made to the ensuing detailed description and accompanying drawings. Other aspects, objects and advantages of the invention will be apparent from the drawings and detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 illustrates a jaw and an incremental positioning appliance for the jaw, in accordance with an embodiment of the present invention.

[0010] Figure 2 shows an arrangement of polymer layers in a sheet having a hard polymer layer disposed between two soft polymer layers, in accordance with an embodiment of the present invention.

[0011] Figure 3 depicts a method of making a multilayer dental appliance, in accordance with an embodiment of the present invention.

[0012] Figure 4 is a simplified block diagram illustrating a method for fabricating a dental appliance, in accordance with an embodiment of the present invention.

[0013] Figure 5 provides a stress relaxation comparison for dental appliances, in accordance with an embodiment of the present invention.

[0014] Figure 6 provides another stress relaxation comparison for dental appliances, in accordance with an embodiment of the present invention.

[0015] Figure 7 shows a long-term unloading comparison for dental appliances, in accordance with an embodiment of the present invention.

[0016] Figure 8 provides a long-term movement comparison for dental appliances, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0017] In the following description, various embodiments of the present invention will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the embodiments. However, it will also be apparent to one skilled in the art that the present invention may be practiced without the specific details. Furthermore, well-known features may be omitted or simplified in order not to obscure the embodiment being described.

[0018] Multilayer orthodontic positioning appliances are provided, as well as related methods and systems. During orthodontic treatment, it may be necessary to apply forces to a tooth to generate movement of the tooth to, for example, bring the patient's teeth into a better occlusion in a mesial or distal direction. The presently disclosed appliances, methods, and systems provide means by which such forces can be applied during orthodontic treatment where appliances having teeth receiving cavities are used, such as preformed appliances/aligners available from Align Technology, Inc., San Jose, CA, under the trade name Invisalign® System. As provided by the present invention, the aligners that include multilayer sheets can, for example, provide increased durability of the aligners so that they can better withstand wear due to aligner reinsertion and removal and other mechanical stresses put on the aligner during treatment. In addition, the aligners have improved elastic properties that allow for less degradation in the shape of the teeth receiving cavities during a stage of treatment. For example, during a multistage orthodontic treatment, the force exerted by an aligner to perform defined

tooth movement can degrade and may cause the treatment to include more aligners to reach a final ideal arrangement and/or result in a mid-course correction that could be prevented by using aligners with improved physical properties, such as those provided herein.

[0019] In one embodiment, the present invention provides a dental appliance for positioning a patient's teeth. The dental appliance can include a removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of the patient's teeth and apply a resilient positioning force to the patient's teeth, the appliance comprising a hard polymer layer disposed between a first soft polymer layer and a second soft polymer layer.

[0020] In another embodiment, the present invention provides an orthodontic system for positioning a patient's teeth. The orthodontic system can include a plurality of incremental position adjustment appliances having teeth receiving cavities shaped to directly receive at least some of the patient's teeth and apply a resilient positioning force to the patient's teeth, wherein the appliances are successively worn by a patient to move teeth from one arrangement to a successive arrangement, and wherein at least one of the appliances comprises a hard polymer layer disposed between a first soft polymer layer and a second soft polymer layer.

[0021] In yet another embodiment, the present invention provides a method of making a dental appliance for positioning a patient's teeth. The method can include providing a sheet comprising a hard polymer layer of polymeric material disposed between a first soft polymer layer and a second soft polymer layer, providing a positive model of the patient's teeth in a target position; and fabricating an appliance as a negative of the positive model comprising thermoforming the sheet over the positive model.

[0022] Referring now to the drawings, in which like reference numerals represent like parts throughout the several views, Figure 1 provides an appropriate starting point in a detailed discussion of various embodiments of the present invention with respect to tooth repositioning appliances designed to apply repositioning forces to teeth. A tooth repositioning appliance 10 can be worn by a patient in order to achieve an incremental repositioning of individual teeth in the jaw 12. The appliance can include a shell (*e.g.*, a polymeric shell) having teeth-receiving cavities that receive and resiliently reposition the teeth. In many embodiments, a polymeric appliance can be formed from a sheet of suitable layers of polymeric material. An appliance can fit over all teeth present in an upper or lower jaw, or less than all of the teeth. In some cases, only certain teeth received by an appliance will be repositioned by the appliance while other teeth can provide a base or anchor region for holding the appliance in place as it applies force against the tooth or teeth targeted for repositioning. In some cases, many or most, and even all, of the teeth will be repositioned at some point during treatment.

Teeth that are moved can also serve as a base or anchor for holding the appliance as it is worn by the patient. Typically, no wires or other means will be provided for holding an appliance in place over the teeth. In some cases, however, it may be desirable or necessary to provide individual anchors on teeth with corresponding receptacles or apertures in the appliance so that the appliance can apply a selected force on the tooth. Exemplary appliances, including those utilized in the Invisalign® System, are described in numerous patents and patent applications assigned to Align Technology, Inc. including, for example, in U.S. Pat. Nos. 6,450,807, and 5,975,893, as well as on the company's website, which is accessible on the World Wide Web (see, *e.g.*, the url invisalign.com).

[0023] An appliance can be designed and/or provided as part of a set of a plurality of appliances. In such an embodiment, each appliance may be configured so a tooth-receiving cavity has a geometry corresponding to an intermediate or final tooth arrangement intended for the appliance. The patient's teeth can be progressively repositioned from an initial tooth arrangement to a target tooth arrangement by placing a series of incremental position adjustment appliances over the patient's teeth. A target tooth arrangement can be a planned final tooth arrangement selected for the patient's teeth at the end of all planned orthodontic treatment. Alternatively, a target arrangement can be one of many intermediate arrangements for the patient's teeth during the course of orthodontic treatment, which may include where surgery is recommended, where inter-proximal reduction (IPR) is appropriate, where a progress check is scheduled, where anchor placement is best, where palatal expansion is desirable, etc. As such, it is understood that a target tooth arrangement can be any planned resulting arrangement for the patient's teeth that follows one or more incremental repositioning stages. Likewise, an initial tooth arrangement can be any initial arrangement for the patient's teeth that is followed by one or more incremental repositioning stages. The adjustment appliances can be generated all at the same stage or in sets or batches, *e.g.*, at the beginning of a stage of the treatment, and the patient wears each appliance until the pressure of each appliance on the teeth can no longer be felt or has resulted in the maximum amount of expressed tooth movement for that given stage. A plurality of different appliances (*e.g.*, set) can be designed and even fabricated prior to the patient wearing any appliance of the plurality. After wearing an appliance for an appropriate period of time, the patient replaces the current appliance with the next appliance in the series until no more appliances remain. The appliances are generally not affixed to the teeth and the patient may place and replace the appliances at any time during the procedure (*e.g.*, patient-removable appliances). The final appliance or several appliances in the series may have a geometry or geometries selected to overcorrect the tooth arrangement, *i.e.*, have a geometry which would (if fully achieved) move individual teeth beyond the tooth arrangement which has been selected as the "final." Such over-correction may be

desirable in order to offset potential relapse after the repositioning method has been terminated, *i.e.*, to permit movement of individual teeth back toward their pre-corrected positions. Over-correction may also be beneficial to speed the rate of correction, *i.e.*, by having an appliance with a geometry that is positioned beyond a desired intermediate or final position, the individual teeth will be shifted toward the position at a greater rate. In such cases, the use of an appliance can be terminated before the teeth reach the positions defined by the appliance.

[0024] In general, structures, methods and systems of the present invention utilize a multilayer sheet for use in orthodontic appliances. The multilayer sheet can include three layers, in which a hard polymer layer is disposed between two soft polymer layers. The multilayer sheets used in the present invention can be used in making dental aligners having improved durability for use, e.g., to the elastic properties of the multilayer sheet when formed into an aligner. In addition, the bonding strength between the layers further improves the durability of the aligners, for example, by withstanding teeth grinding by a patient.

[0025] Figure 2 shows a multilayer structure according to the present invention. As shown, a multilayer sheet 20 can include a three layer structure: a hard polymer layer 24 and two soft polymer layers 22, 26. The hard polymer layer can be disposed between a first soft polymer layer and a second soft polymer layer. In some embodiments, the hard polymer layer can be thicker than either of the soft polymer layers. The soft polymer layers can have the same or different thicknesses. For example, the hard polymer layer can have a thickness in a range from about 400 μm to about 1100 μm , about 450 μm to about 1000 μm , about 500 μm to about 900 μm , or about 550 μm to about 750 μm . The soft polymer layers can have a thickness in a range from about 25 μm to about 100 μm , about 30 μm to about 90 μm , or about 35 μm to about 80 μm . Multilayer sheets used for making appliances having a hard polymer layer disposed between two soft polymer layers can range from a thickness of about 500 μm to about 1200 μm , about 550 μm to about 1100 μm , or about 600 μm to about 1000 μm . In some embodiments, the thicknesses of the various layers can be tailored for a particular stage of treatment for the patient.

[0026] Suitable polymeric materials for the hard polymer layer can include a polyester, a co-polyester, a polycarbonate, a thermoplastic polyurethane, a polypropylene, a polyethylene, a polypropylene and polyethylene copolymer, an acrylic, a cyclic block copolymer, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a polyethersulfone, a polytrimethylene terephthalate or a combination thereof (e.g., a blend of at least two of the listed hard polymeric materials). In some embodiments, the hard polymer layer of the appliances can include polymeric materials, such as a polycarbonate, a co-polyester, a polyester, and a thermoplastic

polyurethane. In some embodiments, the hard layer can be composed of multiple hard layers, e.g., two or three hard polymer layers 24-1, 24-2, 24-N co-extruded to form one hard layer.

[0027] The hard polymer layer of the appliances of the present invention can have a variety of physical properties that can, e.g., improve treatment options for a practitioner. For example, physical properties such as tensile strength, elongation at yield, elongation at break, tensile modulus, flexural modulus, stress relaxation over time, and light transmission can each be specifically tailored for a particular application. In some embodiments, the hard polymer layer of the appliances can have a physical property of at least one of a tensile strength at yield of between about 4000 pounds per square inch (psi) and 6500 psi, an elongation at yield of greater than about 4%, an elongation at break of greater than about 70%, a tensile modulus of greater than about 150,000 psi, a flexural modulus greater than about 150,000 psi, a stress relaxation at 24 hours testing in a wet environment (e.g., between about 90%-100% relative humidity) is greater than 10%, and a light transmission between 400 nm and 800 nm of greater than about 75%.

[0028] Suitable polymeric materials for the soft polymer layers of the appliance can include a styrenic block copolymer (SBC), a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a polyurethane elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, a thermoplastic polyamide elastomer, or a combination thereof (e.g., a blend of at least two of the listed soft polymeric materials). The soft polymer layers can be the same material or a different material. In certain embodiments, the first soft polymer layer and the second soft polymer layer are the same polymeric material.

[0029] The soft polymer layers of the appliances can have a variety of physical properties. For example, physical properties such as hardness, ultimate tensile strength, elongation at break, tensile modulus, compression set, flexural modulus, and light transmission can each be specifically tailored for a particular application. In some embodiments, the soft polymer layers of the appliances can independently have a physical property of at least one of a hardness of about 60A to about 85D, an ultimate tensile strength of greater than about 5000 psi, an elongation at break of greater than about 200 %, a compression set at about 70°C of greater than 40% after 24 hours, a flexural modulus of greater than about 35,000 psi, and a light transmission between 400 nm and 800 nm of greater than about 75%.

[0030] As described herein, the layers of the appliances can include a hard polymer layer disposed between two soft polymer layers. In one embodiment, the multilayer appliances can include a hard polymer layer of one type of material (e.g., a co-polyester), and two soft polymer layers of other types of material that can be the same or different (e.g., two soft polymer layers of thermoplastic

polyurethane elastomer). In some embodiments, the multilayer appliances can also include a hard polymer layer of at least two layers of polymer material. For example, the hard polymer layer can include several polymer layers laminated together to form the hard polymer layer. The laminated hard polymer layer can include at least two layers of any combination of the following polymer materials: a polyester, a co-polyester, a polycarbonate, a thermoplastic polyurethane, a polypropylene, a polyethylene, a polypropylene and polyethylene copolymer, an acrylic, a cyclic block copolymer, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a polyethersulfone, and a polytrimethylene terephthalate. Similarly, in some embodiments, the multilayer appliances can include a soft polymer layer of at least two layers of polymer material. For example, the soft polymer layers 22, 26 can include a layer of several polymer layers 22-1, 22-2, 22-N and 26-1, 26-2, 26-N, respectively, laminated together. The laminated soft polymer layers can include at least two layers of any combination of the following polymer materials: a styrenic block copolymer (SBC), a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a polyurethane elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, and a thermoplastic polyamide elastomer.

[0031] The tooth positioning appliances can be fabricated using a variety of methods. For example, methods for making the appliances can include thermoforming a multilayer sheet into an aligner by heating the sheet and then molding the sheet to a particular configuration. Exemplary methods for fabricating the appliances, including those utilized in the Invisalign® System, are described in numerous patents and patent applications assigned to Align Technology, Inc. including, for example, in U.S. Appl. No. 13/186,374 as well as on the company's website, which is accessible on the World Wide Web (see, *e.g.*, the url invisalign.com").

[0032] Figure 3 depicts an example embodiment of a process 30 for forming a multilayer tooth positioning appliance, in accordance with an embodiment of the present invention. As shown, a multilayer sheet 32 can be formed into a tooth positioning appliance 36. The multilayer sheet 32, as depicted, can include three layers: a hard polymer layer disposed between two soft polymer layers. In this example process, the tooth positioning appliance 36 can be produced with the use of a physical tooth model, or mold, 34. The tooth positioning appliance 36 can be produced by heating the thermoformable multilayer sheet 32 and then vacuum or pressure forming the sheet over the teeth in the physical tooth model 34. The tooth positioning appliance 36 is a direct representation of the physical tooth model. Excess material from the sheet can be trimmed to form a final tooth positioning appliance that can be used for orthodontic treatment of a patient.

[0033] One or a series of physical tooth models, such as the model described above, may be used in the generation of elastic repositioning appliances for orthodontic treatment. Similar to the process above, each of the appliances can be generated by thermoforming a multilayer polymeric material over a mold of a desired tooth arrangement to form a dental appliance. The tooth positioning appliance of the desired tooth arrangement generally conforms to a patient's teeth but is slightly out of alignment with the initial tooth configuration. Placement of the elastic positioner over the teeth applies controlled forces in specific locations to gradually move the teeth into the desired configuration. Repetition of this process with successive appliances comprising new configurations eventually moves the teeth through a series of intermediate configurations to a final desired configuration.

[0034] The present invention includes a variety of methods for fabricating dental appliances. Figure 4 shows a simple schematic for a method 40 of fabricating a removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of the patient's teeth and apply a resilient positioning force to the patient's teeth, in accordance with an embodiment of the present invention. The method can include providing a multilayer sheet having a hard polymer layer disposed between two soft polymer layers (Step 42). The method can further include providing a positive physical model of a patient's teeth (Step 44). The tooth positioning appliance can be fabricated by thermoforming the multilayer sheet over the positive physical model (Step 46), in which the tooth positioning appliance is a negative of the positive model. As described above, the methods of fabrication can further include trimming or cutting portions of the sheet to render a final, usable appliance for orthodontic treatment.

[0035] Multilayer sheets of the present invention were analyzed and determined to provide a variety of improved properties for aligners used in orthodontic treatment. As further described herein, the multilayer sheets formed into aligners can, for example, provide increased durability of the aligners so that they can better withstand wear due to teeth grinding and other mechanical stresses put on the aligner during treatment. In addition, the aligners have improved elastic properties that allow for less degradation in the shape of the teeth receiving cavities during a stage of treatment. For example, during a multistage orthodontic treatment, the capability of an aligner to force tooth movement can degrade and may cause the treatment to include more aligners to reach a final ideal arrangement and/or result in a mid-course correction that could be prevented by using aligners with improved physical properties, such as those provided herein.

[0036] Figures 5-8 provide example test results that compare various physical properties of the multilayer sheet appliances of the present invention with other already existing aligner materials (Material 1). Samples of varied thicknesses were tested. For example, multilayer sheets were tested

having a hard polymer layer with thicknesses ranging from about 580 μm to about 715 μm thick. In some examples, the hard layer was a co-polyester hard polymer layer. The soft layers tested ranged between about 50 μm to about 100 μm . In some examples, the hard polymer layer was disposed between thermoplastic polyurethane elastomer soft polymer layers. As shown in Figures 5 and 6, one example of the multilayer sheet material (Material 2) showed improved stress relaxation properties as compared to another already existing material (Material 1) at room temperature and at a 37 °C/90-100% relative humidity condition. In addition, Figure 7 shows improved long-term unloading characteristics of the multilayer sheet Material 2 versus the already existing Material 1 in a 37 °C/90-100% relative humidity condition. The multilayer sheet showed less deflection under force loads. Figure 8 also shows improved long-term movement data for the multilayer sheet Material 2 versus Material 1 in a 37 °C/90-100% relative humidity condition.

[0037] The use of the terms “a” and “an” and “the” and similar referents in the context of describing embodiments (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms “comprising,” “having,” “including,” and “containing” are to be construed as open-ended terms (i.e., meaning “including, but not limited to,”) unless otherwise noted. The term “connected” is to be construed as partly or wholly contained within, attached to, or joined together, even if there is something intervening. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., “such as”) provided herein, is intended merely to better illuminate embodiments and does not pose a limitation on the scope unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of at least one embodiment.

[0038] Variations of the embodiments described herein may become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventors expect skilled artisans to employ such variations as appropriate, and the inventors intend for embodiments to be constructed otherwise than as specifically described herein. Accordingly, suitable embodiments include all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is contemplated as being incorporated into some suitable embodiment unless otherwise indicated herein

or otherwise clearly contradicted by context. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the pending claims along with their full scope or equivalents.

CLAIMS

WHAT IS CLAIMED IS:

1. A multilayer sheet comprising:
 - a first layer comprising a co-polyester having a flexural modulus greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, a tensile strength at yield of 4000-6500 psi, and an elongation at break of greater than 70%; and
 - a second layer comprising a thermoplastic polyurethane elastomer having a flexural modulus greater than 35,000 psi, an ultimate tensile strength of greater than 5000 psi; an elongation at break of greater than 200%, and a hardness of 60A to 85D; and
 - a third layer;wherein the co-polyester has an elastic modulus greater than the thermoplastic polyurethane elastomer; and
wherein the multilayer sheet is incorporated into an orthodontic appliance.
2. The multilayer sheet of claim 1, wherein the third layer comprises a same or different co-polyester; and wherein the first layer is disposed between the second layer and the third layer.
3. The multilayer sheet of claim 1, comprising a fourth layer comprising a same or different thermoplastic polyurethane elastomer; and wherein the first layer and the third layer are disposed between the fourth layer and the second layer.
4. The multilayer sheet of claim 1, wherein the first layer has a light transmission between 400 nm and 800 nm of greater than about 75%.
5. The multilayer sheet of claim 1, wherein the first layer is coextruded with or laminated to the third layer.
6. A multilayer dental aligner for repositioning a patient's teeth from a first arrangement toward a second arrangement, the multilayer dental aligner comprising:
 - a multilayer sheet comprising:
 - a first layer comprising a co-polyester having a flexural modulus greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, a tensile strength at yield of 4000-6500 psi, and an elongation at break of greater than 70%; and

a second layer comprising a thermoplastic polyurethane elastomer having a flexural modulus greater than 35,000 psi, an ultimate tensile strength of greater than 5000 psi; an elongation at break of greater than 200%, and a hardness of 60A to 85D; and

wherein the multilayer sheet forms a plurality of tooth-receiving cavities configured to receive and reposition the patient's teeth from the first arrangement toward the second arrangement.

7. The multilayer dental aligner of claim 6, wherein the multilayer sheet further comprises a third layer comprising a same or different co-polyester or a same or different thermoplastic polyurethane elastomer.

8. The multilayer dental aligner of claim 6, wherein the multilayer sheet further comprises a third layer comprising a same or different co-polyester; wherein the multilayer sheet further comprises a fourth layer comprising a same or different thermoplastic polyurethane elastomer, and wherein the third layer and the first layer are disposed between the second layer and the fourth layer.

9. The multilayer dental aligner of claim 6, wherein the co-polyester has an elastic modulus greater than the thermoplastic polyurethane elastomer.

10. A multilayer dental aligner for repositioning a patient's teeth from a first arrangement toward a second arrangement, the multilayer dental aligner comprising:

a multilayer sheet comprising:

a first layer comprising a co-polyester having a flexural modulus of greater than 150,000 psi;

a second layer comprising a thermoplastic polyurethane elastomer;

a third layer; and

wherein the multilayer sheet forms a plurality of tooth-receiving cavities configured to receive and reposition the patient's teeth from the first arrangement toward the second arrangement.

11. The multilayer dental aligner of claim 10, wherein the first layer comprises a co-polyester having an elongation at break of greater than 70% and wherein the second layer comprises a thermoplastic polyurethane elastomer having an elongation at break of greater than 200%.

12. The multilayer dental aligner of claim 10, wherein the first layer comprises a co-polyester having an elongation at yield of greater than 4%.

13. The multilayer dental aligner of claim 10, wherein the third layer comprises a same or different co-polyester or a same or different thermoplastic polyurethane elastomer.
14. The multilayer dental aligner of claim 13, wherein the first layer is disposed adjacent to the third layer.
15. The multilayer dental aligner of claim 13, wherein the first layer is co-extruded with or laminated to the third layer.
16. The multilayer dental aligner of claim 10, wherein the multilayer sheet further comprises a fourth layer and wherein the first layer and the third layer are disposed between the second layer and the fourth layer.
17. The multilayer dental aligner of claim 16, wherein the fourth layer comprises a same or different thermoplastic polyurethane elastomer.
18. The multilayer dental aligner of claim 10, wherein the first layer is disposed between the second layer and the third layer.
19. The multilayer dental aligner of claim 10, wherein the co-polyester has an elastic modulus greater than the thermoplastic polyurethane elastomer.
20. A multilayer dental aligner for repositioning a patient's teeth from a first arrangement toward a second arrangement, the multilayer dental aligner comprising:
a multilayer sheet comprising:
a first layer comprising a co-polyester having an elongation at break of greater than 70%; and
a second layer comprising a thermoplastic polyurethane elastomer having an elongation at break of greater than 200%; and
wherein the multilayer sheet forms a plurality of tooth-receiving cavities configured to receive and reposition the patient's teeth from the first arrangement toward the second arrangement.
21. The multilayer dental aligner of claim 20, wherein the multilayer sheet further comprises a third layer.

22. The multilayer dental aligner of claim 21, wherein the third layer comprises a same or different thermoplastic polyurethane elastomer.
23. The multilayer dental aligner of claim 21, wherein third layer comprises a same or different co-polyester, and wherein the third layer is co-extruded with or laminated to the first layer.
24. The multilayer dental aligner of claim 21, wherein the third layer is disposed adjacent the first layer.
25. The multilayer dental aligner of claim 20, wherein the thermoplastic polyurethane elastomer of the second layer has a compression set of greater than 40% after 24 hours at 70° C.
26. The multilayer dental aligner of claim 20, wherein the co-polyester of the first layer has a flexural modulus greater than 150,000 psi.
27. The multilayer dental aligner of claim 26, wherein the thermoplastic polyurethane elastomer of the second layer has a flexural modulus greater than 35,000 psi.
28. The multilayer dental aligner of claim 20, wherein the thermoplastic polyurethane elastomer of the second layer has a hardness from 60 A to 85 D.
29. The multilayer dental aligner of claim 20, wherein the first layer has a light transmission between 400 nm and 800 nm of greater than about 75%.
30. The multilayer dental aligner of claim 20, wherein the co-polyester has an elastic modulus greater than the thermoplastic polyurethane elastomer.

ABSTRACT OF THE DISCLOSURE

Multilayer polymer sheets are provided, as well as related methods, systems, and appliances.

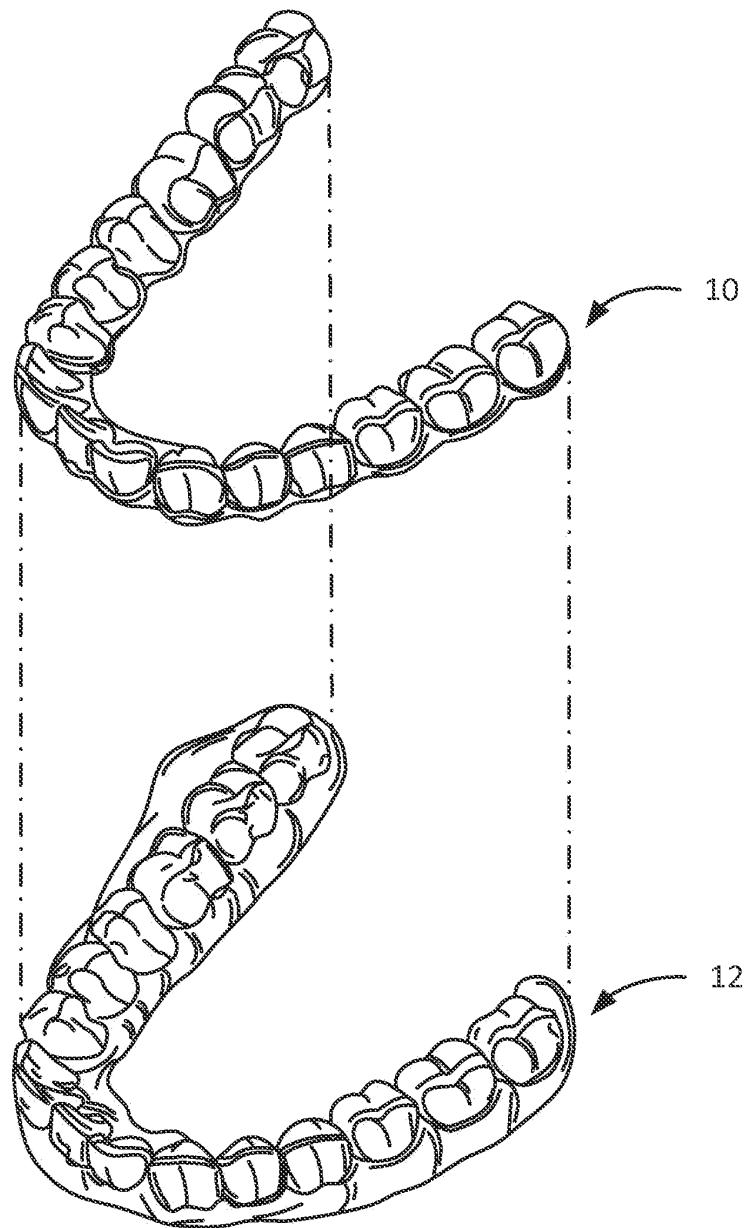
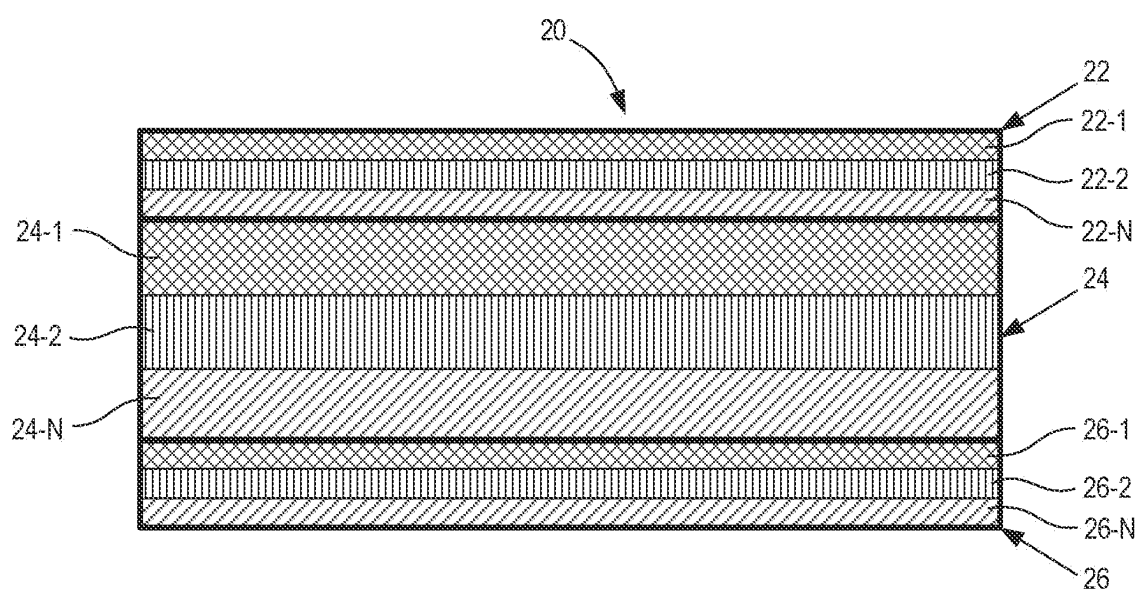


FIG. 1

**FIG. 2**

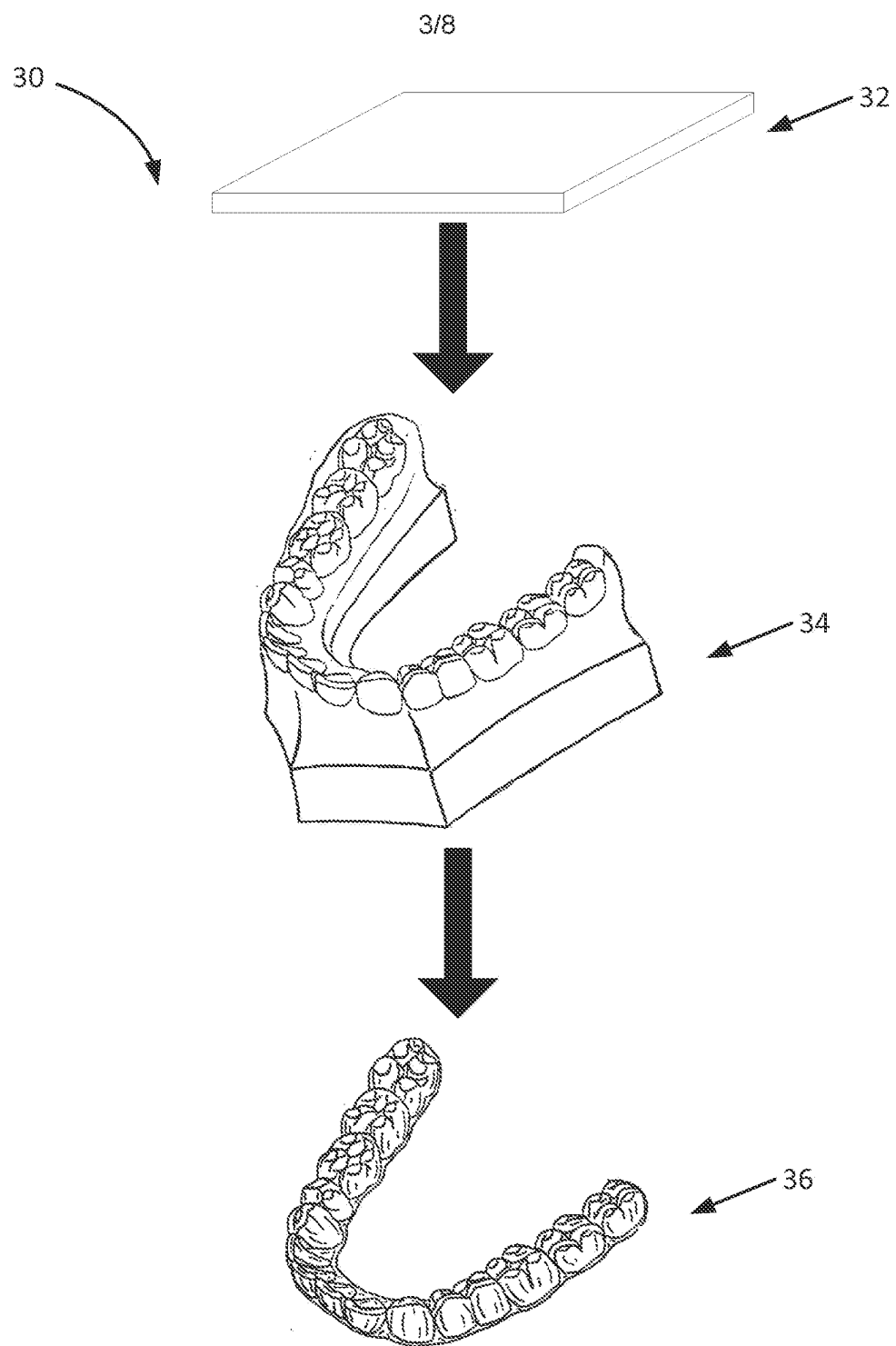


FIG. 3

4/8

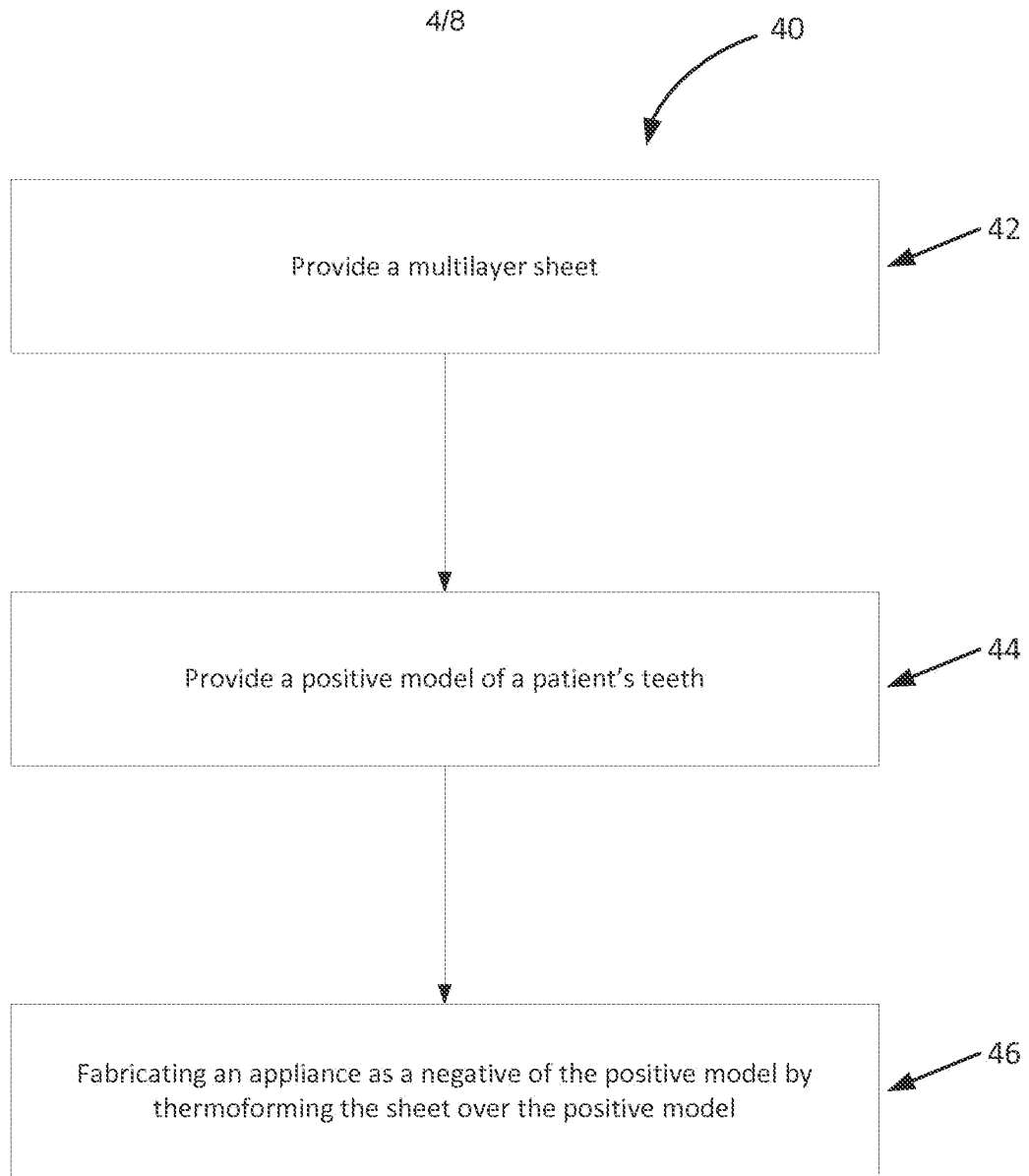


FIG. 4

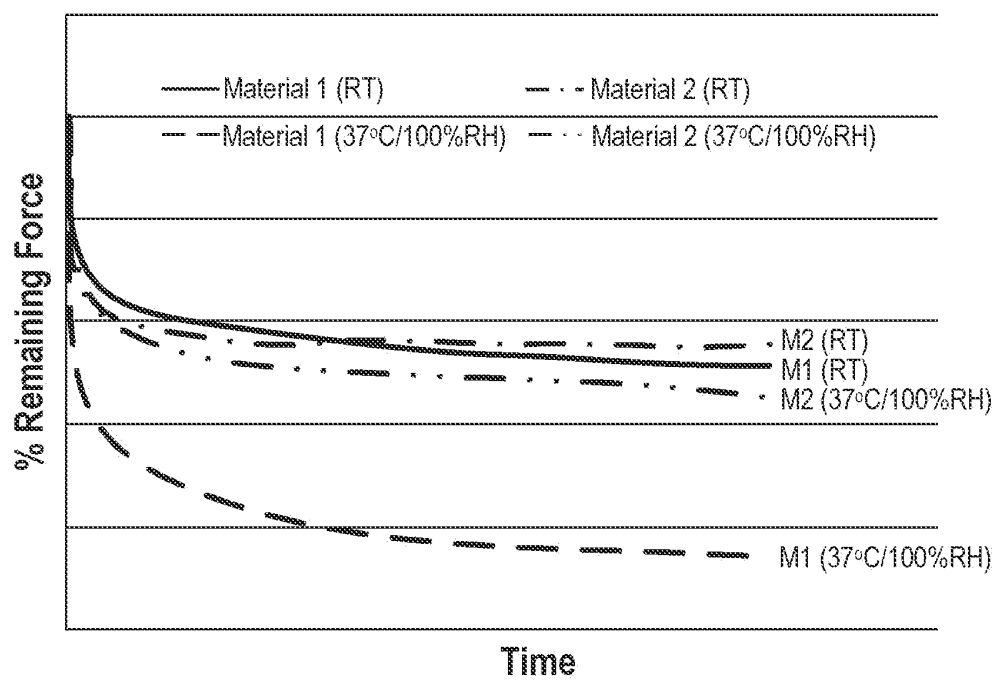


FIG. 5

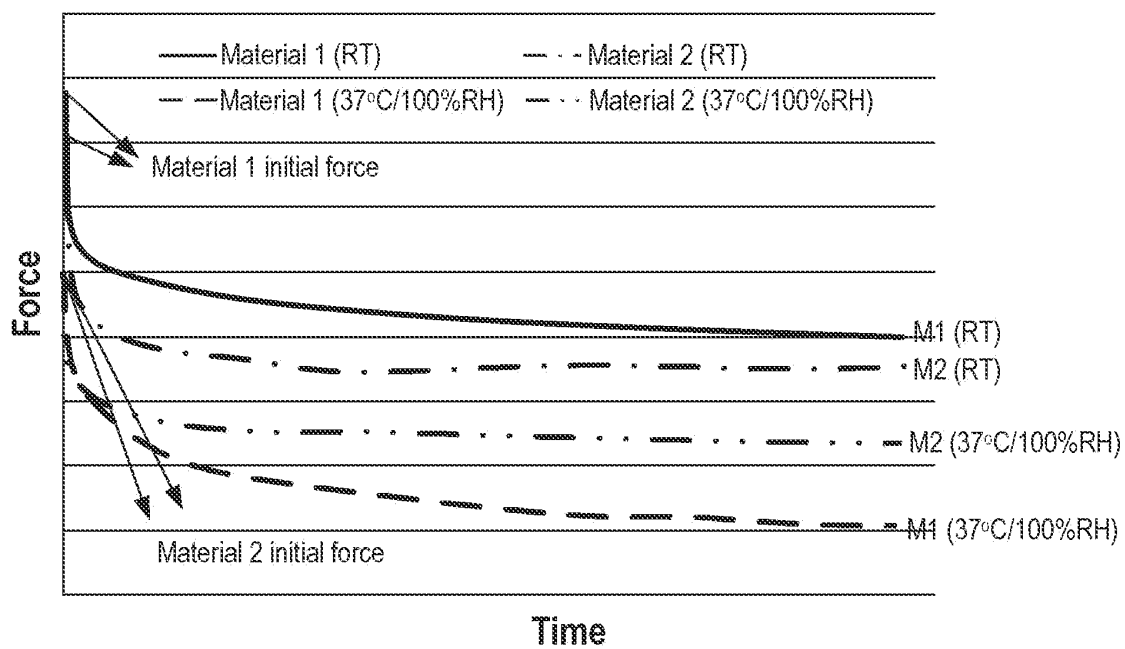
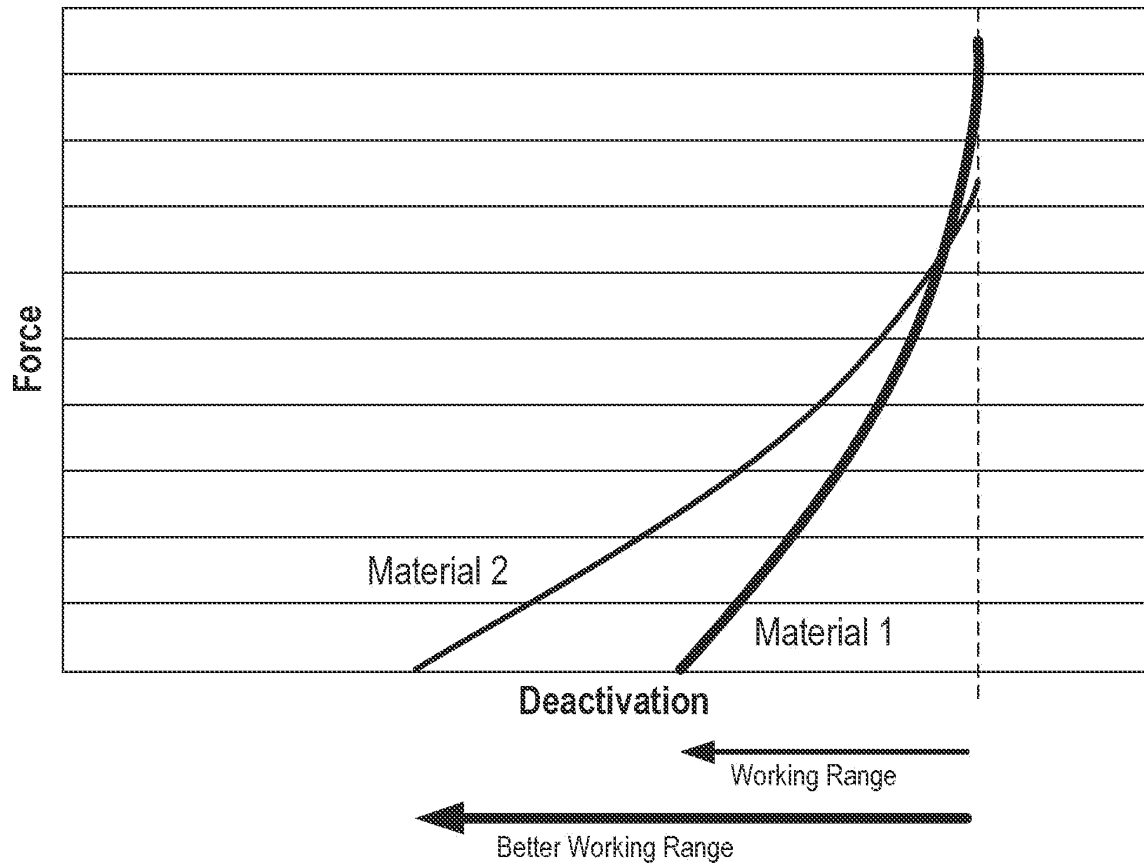
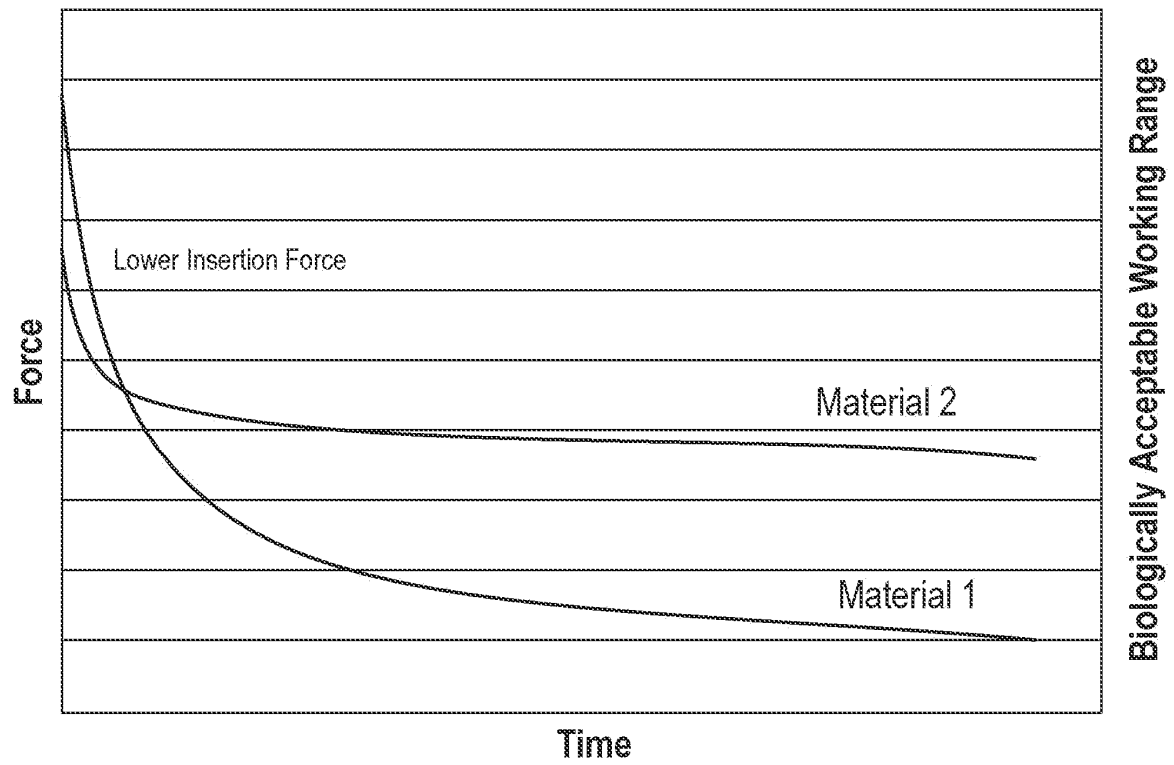


FIG. 6

**FIG. 7**

**FIG. 8**

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
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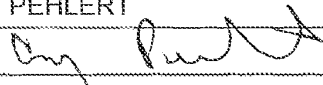
Title of Invention	MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS
As the below named inventor, I hereby declare that:	
This declaration is directed to: ☐ The attached application, or	
☒ United States application or PCT International application number <u>15/476,655</u>	
filed on <u>March 31, 2017</u>	
The above-identified application was made or authorized to be made by me.	
I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.	
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.	
WARNING:	
Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>Joerg NICKEL</u>	Date (Optional): <u>April 11, 2017</u>
Signature: <u>Joerg Nickel</u>	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number <u>15/476,655</u> filed on <u>March 31, 2017</u> The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Craig PEHLERT</u> Date (Optional): _____ Signature:  Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS
-----------------------	--

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or
☒ United States application or PCT international application number 15/476,655
filed on March 31, 2017

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

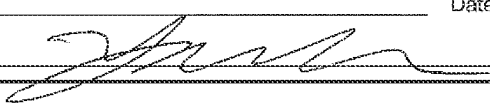
Inventor: Heinz PUDLEINER Date (Optional): 11.04.2017
Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

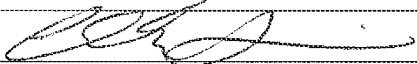
Title of Invention	MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS
As the below named inventor, I hereby declare that: This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number <u>15/476,655</u> filed on <u>March 31, 2017</u> The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.	
LEGAL NAME OF INVENTOR	
Inventor: <u>Yan CHEN</u> Date (Optional) : _____	
Signature: 	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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LEGAL NAME OF INVENTOR	
Inventor: <u>Chunhua LI</u> Date (Optional): <u>4/18/17</u>	
Signature: 	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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LEGAL NAME OF INVENTOR	
Inventor: <u>Klaus MEYER</u> Date (Optional): <u>April 14, 2017</u>	
Signature: <u><i>Klaus Meyer</i></u>	
Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒

Practitioners associated with Customer Number: 107046

OR

☐

Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒

The address associated with Customer Number: 107046

OR

☐

Firm or individual name

Address

City

State

Zip

Country

Telephone

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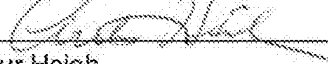
Assignee name and address:
Align Technology, Inc.
2620 Orchard Parkway
San Jose, California 95134

A copy of this form, together with a statement under 37 CFR 3.73(c) [Form PTO/AIA/86 or equivalent] is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature



Date September 13, 2017

Name Arthur Hsieh

Telephone 408-470-1000

Title VP, Associate General Counsel, Intellectual Property & Licensing

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Align Technology, Inc.

Application No./Patent No.: Unassigned Filed/Issue Date: Herewith (September 2, 2022)

Titled: MULTILAYER POLYMER SHEETS

Align Technology, Inc., a Delaware Corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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STATEMENT UNDER 37 CFR 3.73(c)

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The document was recorded in the United States Patent and Trademark Office at
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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Garrett T. Potter/

Signature

Garrett T. Potter

Printed or Typed Name

September 2, 2022

Date

76,602

Title or Registration Number

ASSIGNMENT OF PATENT APPLICATION

JOINT

WHEREAS, Chunhua Li of 19688 Vicksburg Dr., Cupertino, CA 95014 and Yan Chen of 10461 Pineville Ave., Cupertino, CA 95014, hereinafter referred to as "Assignors," are the inventors of the invention described and set forth in the below-identified application for United States Letters Patent:

Title of Invention: MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS

Date(s) of execution of Declaration:

Filing Date: May 14, 2012

Application No.: 13/470,681; and

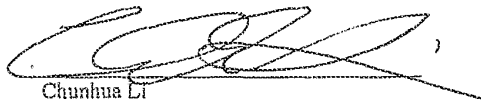
WHEREAS, ALIGN TECHNOLOGY, INC., a corporation of the state of Delaware, located at 2560 Orchard Parkway, San Jose, CA 95131, hereinafter referred to as "ASSIGNEE," is desirous of acquiring an interest in the invention and application and in any U.S. Letters Patent and Registrations which may be granted on the same;

For good and valuable consideration, receipt of which is hereby acknowledged by Assignors, Assignors have assigned, and by these presents do assign to Assignee all right, title and interest in and to the invention and application and to all foreign counterparts (including patent, utility model and industrial designs), and in and to any Letters Patent and Registrations which may hereafter be granted on the same in the United States and all countries throughout the world, and to claim the priority from the application as provided by the Paris Convention. The right, title and interest is to be held and enjoyed by Assignee and Assignee's successors and assigns as fully and exclusively as it would have been held and enjoyed by Assignors had this Assignment not been made, for the full term of any Letters Patent and Registrations which may be granted thereon, or of any division, renewal, continuation in whole or in part, substitution, conversion, reissue, prolongation or extension thereof.

Assignors further agree that they will, without charge to Assignor, but at Assignee's expense, (a) cooperate with Assignee in the prosecution of U.S. Patent applications and foreign counterparts on the invention and any improvements, (b) execute, verify, acknowledge and deliver all such further papers, including patent applications and instruments of transfer, and (c) perform such other acts as Assignee lawfully may request to obtain or maintain Letters Patent and Registrations for the invention and improvements in any and all countries, and to vest title thereto in Assignee, or Assignee's successors and assigns.

IN TESTIMONY WHEREOF, Assignors have signed their names on the dates indicated.

Dated: 5/16/12

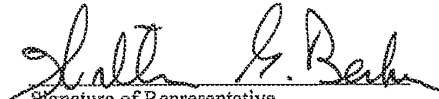

Chunhua Li

Dated: 5/16/2012


Yan Chen

Assignment
Attorney Docket No.: 83289-831160 (022900US)
Page 2

Dated: 5-16-2017


Signature of Representative
For Assignee

William G. Becker
Printed Name

Sr. Director, IP
Title

ACKNOWLEDGMENT

State of California
County of Santa Clara

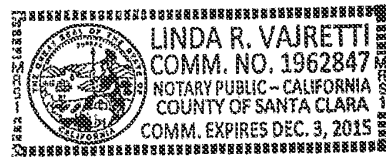
On May 16, 2012 before me, Linda R. Vajretti, Notary Public
(Insert name and title of the officer)

personally appeared Chunhua Li and Yan Chen
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) ~~is~~ are
subscribed to the within instrument and acknowledged to me that ~~he~~ ~~she~~ they executed the same in
~~his~~ ~~her~~ their authorized capacity(ies), and that by ~~his~~ ~~her~~ their signature(s) on the instrument the
person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing
paragraph is true and correct.

WITNESS my hand and official seal.

Signature Linda R. Vajretti (Seal)



CORPORATE TO CORPORATE ASSIGNMENT

Docket Number 22773-826.201

WHEREAS Covestro Deutschland Aktiengesellschaft, Kaiser-Wilhelm Allee 60, D-51373 Leverkusen, Federal Republic of Germany (hereinafter "Assignor 1"), Covestro LLC, 1 Covestro Circle, Pittsburgh, Pennsylvania 15205, United States of America (hereinafter "Assignor 2") and Align Technology Inc., a corporation of the State of Delaware, having a place of business at 2560 Orchard Parkway, San Jose, California 95131, United States of America (hereinafter "Assignee"), and wherein [REDACTED], and wherein an application entitled:

MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS

for which application serial number 13/470,681 was filed on May 14, 2012, in the United States Patent and Trademark Office [REDACTED]

Said application names inventors from Assignor 1, Assignor 2 and Assignee. These inventors have assigned their invention to their respective company.

WHEREAS the parties have determined [REDACTED] U.S. Ser. Appl. No. 13/470,681, U.S. Ser. Appl. No. 15/132,171, and the divisional application having Docket Number 22773-826.401 and continuation application having Docket Number 22773-826.302 to be filed according to the claims of Annex 1 (hereinafter together "Applications") belongs to Assignee.

WHEREAS in effect the ownership of said Applications to Assignee [REDACTED], Assignor 1 and 2 assign their respective share to Assignee and Assignee accepts such assignment.

NOW, THEREFORE, the parties agree as follows:

- Assignor 1 and 2 hereby assign, all right, title and interests (a) in and to said Applications in the United States, including the right to claim priority to and from said Applications in and for the United States; (b) in and to each and every patent issuing or reissuing from said Applications in the United States; (c) in and to each and every reissue, reexamination, renewal or extension of any kind of any of the foregoing; and (d) in and to all claims for past, present and future infringement of the patent(s) issuing or reissuing from said Applications in the United States, including all rights to sue for and to receive and recover for Assignee's own use all past, present, and future lost profits, royalties, and damages of whatever nature recoverable from an infringement of the patent(s) in the United States. No other rights are hereby assigned or transferred to Assignee by Assignor 1 or Assignor 2 than those set forth in this paragraph 1.
- Assignor 1 and 2 hereby covenant and agree to cooperate with said Assignee to enable said Assignee to enjoy to the fullest extent the right, title and interest herein conveyed in the United States. Such cooperation by the Assignor 1 and 2 shall include prompt production of pertinent facts and documents, giving of testimony, execution of petitions, oaths, specifications, declarations or other papers, and other assistance all to the extent reasonable necessary (a) for perfecting in said Assignee the right, title and interest herein conveyed; (b) for prosecuting said Applications in the United States; (c) for filing and prosecuting substitute, divisional or continuing applications claiming priority on said Applications in the United States; (d) for filing and prosecuting applications for reissuance of any patent(s) issuing from said Applications in the United States; (e) for interference or other priority proceedings involving said Applications in the United States; Assignee shall reimburse Assignor 1 and Assignor 2 for costs incurred by Assignor 1 and Assignor 2 in providing assistance and support to Assignee in connection with this paragraph 2.
- The terms and covenants of this assignment shall inure to the benefit of said Assignee, its successors, assigns and other legal representatives, and shall be binding upon the Assignor 1 and 2, its successors, assigns and other legal representatives.
- Assignor 1 and 2 hereby warrant, represent and covenant that said Assignor 1 and 2 have not entered and will not enter into any assignment, contract, or understanding in conflict herewith.
- Assignor 1 and 2 hereby request that any patent(s) issuing in the United States, be issued in the name of the Assignee, or its successors and assigns, for the sole use of said Assignee, its successors, legal representatives and assigns.
- This instrument will be interpreted and construed in accordance with the laws of the State of Delaware, without regard to conflict of law principles. If any provision of this instrument is found to be illegal or unenforceable, the other provisions shall remain effective and enforceable to the greatest extent permitted by law. This instrument may be executed in counterparts, each of which is deemed an original, but all of which together constitute one and the same agreement.

IN WITNESS WHEREOF, said Assignor 1 and 2 have executed and delivered this instrument to said Assignee as of the date written below.

Date: 30. MRZ. 2017

ASSIGNOR 1

By: Dr. Gilbert Voortmans, LL.M.
Name: Dr. Gilbert Voortmans, LL.M.
Title: Vice President
Head of Intellectual Property Rights

Date: 2017-03-30

By: Dr. Katrin Jochek
Name: Dr. Katrin Jochek
Title: IP Counsel

CORPORATE TO CORPORATE ASSIGNMENT		Docket Number 22773-826.201
Date: <u>3/29/2017</u>	ASSIGNOR 2 By: <u>[Signature]</u>	<u>3/29/17</u>
	Name: Scott G. Brown Title: Vice President, General Counsel and Secretary	
RECEIVED AND AGREED TO BY ASSIGNEE: Date: <u>March 30, 2017</u>	By: <u>[Signature]</u>	
	Name: Roger E. George Title: Vice President, Corporate & Legal Affairs, General Counsel & Corporate Secretary	

DIVISIONAL CLAIMS

1. A method of making a dental appliance for positioning a patient's teeth, the method comprising:
 - providing a sheet comprising a hard polymer layer of polymeric material disposed between a first soft polymer layer and a second soft polymer layer;
 - providing a positive model of the patient's teeth in a target position; and
 - fabricating an appliance as a negative of the positive model comprising thermoforming the sheet over the positive model.
2. The method of claim 1, wherein the hard polymer layer comprises a layer of a polyester, a co-polyester, a polycarbonate, a thermoplastic polyurethane, a polypropylene, a polyethylene, a polypropylene and polyethylene copolymer, an acrylic, a cyclic block copolymer, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a polyethersulfone, a polytrimethylene terephthalate, or a combination thereof.
3. The method of claim 1, wherein the hard polymer layer comprises at least two layers and the at least two layers are independently selected from a group consisting of a polyester, a co-polyester, a polycarbonate, a thermoplastic polyurethane, a polypropylene, a polyethylene, a polypropylene and polyethylene copolymer, an acrylic, a cyclic block copolymer, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a polyethersulfone, and a polytrimethylene terephthalate.
4. The method of claim 1, wherein each of the first soft polymer layer and the second soft polymer layer independently comprises a layer of a styrenic block copolymer (SBC), a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a polyurethane elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, a thermoplastic polyamide elastomer, or a combination thereof.
5. The method of claim 1, wherein at least one of the first soft polymer layer and the second soft polymer layer comprises at least two layers, and wherein the at least two layers are independently selected from the group consisting of a styrenic block copolymer (SBC), a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a polyurethane elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, or a thermoplastic polyamide elastomer.

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6. The method of claim 1, wherein the hard polymer layer comprises at least one of a tensile strength at yield of between about 4000 pounds psi and 6500 psi, an elongation at yield of greater than about 4%, an elongation at break of greater than about 70%, a tensile modulus of greater than about 150,000 psi, a flexural modulus greater than about 150,000 psi, a stress relaxation at 24 hours testing in a wet environment greater than about 10%, and a light transmission between 400 nm and 800 nm of greater than about 75%.

7. The method of claim 1, wherein the first soft polymer layer and the second soft polymer layer each independently comprise at least one of a hardness of about 60A to about 85D, an ultimate tensile strength of greater than about 5000 psi, an elongation at break of greater than about 200 %, a compression set at about 70 °C of greater than 40% after 24 hours, a flexural modulus of greater than about 35,000 psi, and a light transmission between 400 nm and 800 nm of greater than about 75%.

8. The method of claim 1, further comprising fabricating a plurality of appliances corresponding to different arrangements of the patient's teeth.

9. The method of claim 8, wherein fabricating the plurality of appliances comprises digitally staging a plurality of digital models of the patient's teeth and generating a plurality of physical models from the digital models.

10. The method of claim 8, wherein two or more of the plurality of appliances comprise a sheet comprising a hard polymer layer of polymeric material disposed between a first soft polymer layer and a second soft polymer layer.

11. The method of claim 1, wherein the hard polymer layer comprises a plurality of co-extruded or laminated polymer layers.



CONTINUATION CLAIMS

1. A removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of a patient's teeth and apply a resilient positioning force to the patient's teeth, the appliance comprising:

a first soft outer polymer layer comprising a first soft polymeric material and a second soft outer polymer layer comprising a second soft polymeric material, each of the first and second soft polymer layers having a flexural modulus of greater than about 35,000 psi, a hardness of about 60A to about 85D, and a thickness in a range from 25 μm to 100 μm ; and

a hard inner polymer layer comprising a co-polyester disposed between the first soft outer polymer layer and the second soft outer polymer layer so as to reduce degradation of the resilient positioning force applied to the teeth when the appliance is worn.

2. The appliance of claim 1, wherein the first and second soft polymeric material each respectively comprise a material selected from the group consisting of: a thermoplastic polyurethane elastomer, a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, a thermoplastic polyamide elastomer, or a combination thereof.

3. The appliance of claim 2, wherein the first and second soft polymeric materials each comprise the same material.

4. The appliance of claim 2, wherein the first and second soft polymeric materials comprise different materials.

5. The appliance of claim 2, wherein the first and second soft polymeric materials each comprise a blend of polymeric materials, each respective blend including two or more materials selected from the group consisting of: a thermoplastic polyurethane elastomer, a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, and a thermoplastic polyamide elastomer.

6. The appliance of claim 2, wherein at least one of the first soft outer polymer layer and the second soft outer polymer layer comprises at least two layers.

7. The appliance of claim 1, wherein the hard inner polymer layer comprises a blend of

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polymeric materials including the co-polyester and one or more of: a polyester, a thermoplastic polyurethane, a polypropylene, a polyethylene, a polypropylene and polyethylene copolymer, an acrylic, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a cyclic block copolymer, a polyethersulfone, a polytrimethylene terephthalate, or a combination thereof.

8. The appliance of claim 1, wherein the hard inner polymer layer comprises at least two layers including a first layer comprising the co-polyester and a second layer comprising one or more of: a polyester, a co-polyester, a thermoplastic polyurethane, a polypropylene, a polyethylene, an acrylic, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a cyclic block copolymer, a polyethersulfone, or a polytrimethylene terephthalate.

9. The appliance of claim 1, wherein the hard inner polymer layer has a thickness in a range from 400 μm to 1100 μm .

10. The appliance of claim 1, wherein the hard inner polymer layer, the first soft outer polymer layer, and the second soft outer polymer layer combined have a thickness of 500 μm to 1200 μm .

11. The appliance of claim 1, wherein the hard inner polymer layer comprises at least one of: a tensile strength at yield of between about 4000 pounds per square inch (psi) and 6500 psi, an elongation at yield of greater than about 4%, an elongation at break of greater than about 70%, a tensile modulus of greater than about 150,000 psi, a flexural modulus greater than about 150,000 psi, a stress relaxation at 24 hours testing in a high humidity environment of greater than about 10%, or a light transmission between 400 nm and 800 nm of greater than about 75%.

12. The appliance of claim 1, wherein the first soft outer polymer layer and the second soft outer polymer layer each independently comprise at least one of: an ultimate tensile strength of greater than about 5000 psi, an elongation at break of greater than about 200%, a compression set at about 70 °C of greater than 40% after 24 hours, or a light transmission between 400 nm and 800 nm of greater than about 75%.

13. A plurality of incremental position adjustment appliances having teeth receiving cavities shaped to directly receive at least some of the patient's teeth and apply a resilient positioning force to the patient's teeth, wherein the appliances are shaped to move teeth from one arrangement to a successive arrangement when successively worn by a patient, and wherein at least one of the appliances comprises a

removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of a patient's teeth and apply a resilient positioning force to the patient's teeth, the appliance comprising:

a first soft outer polymer layer comprising a first soft polymeric material and a second soft outer polymer layer comprising a second soft polymeric material, each of the first and second soft polymer layers having a flexural modulus of greater than about 35,000 psi, a hardness of about 60A to about 85D, and a thickness in a range from 25 μ m to 100 μ m; and

a hard inner polymer layer comprising a co-polyester disposed between the first soft outer polymer layer and the second soft outer polymer layer so as to reduce degradation of the resilient positioning force applied to the teeth when the appliance is worn.

14. The plurality of appliances of claim 13, wherein the first and second soft polymeric material each respectively comprise a material selected from the group consisting of: a thermoplastic polyurethane elastomer, a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, a thermoplastic polyamide elastomer, or a combination thereof.

15. A method of moving a patient's teeth from an initial configuration to a target configuration, the method comprising providing a removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of a patient's teeth and apply a resilient positioning force to the patient's teeth, the appliance comprising:

a first soft outer polymer layer comprising a first soft polymeric material and a second soft outer polymer layer comprising a second soft polymeric material, each of the first and second soft polymer layers having a flexural modulus of greater than about 35,000 psi, a hardness of about 60A to about 85D, and a thickness in a range from 25 μ m to 100 μ m; and

a hard inner polymer layer comprising a co-polyester disposed between the first soft outer polymer layer and the second soft outer polymer layer so as to reduce degradation of the resilient positioning force applied to the teeth when the appliance is worn.

16. The method of claim 15, wherein providing the removable orthodontic tooth positioning appliance comprises placing the removable orthodontic tooth positioning appliance on the teeth of a patient.

17. The method of claim 15, wherein providing the removable orthodontic tooth positioning appliance comprises providing a series of incremental position adjustment appliances, said series of incremental position adjustment appliances including the removable orthodontic tooth positioning

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appliance.

18. The method of claim 17, wherein providing the series of incremental position adjustment appliances comprises placing said series of incremental position adjustment appliances over the patient's teeth.

19. The method of claim 15, wherein the first and second soft polymeric material each respectively comprise a material selected from the group consisting of: a thermoplastic polyurethane elastomer, a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, a thermoplastic polyamide elastomer, or a combination thereof.

20. The method of claim 18, wherein the first and second soft polymeric materials comprise different materials.

21. The method of claim 18, wherein the first and second soft polymeric materials each comprise a blend of polymeric materials, each respective blend including two or more materials selected from the group consisting of: a thermoplastic polyurethane elastomer, a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, and a thermoplastic polyamide elastomer.

22. The method of claim 18, wherein the first and second soft polymeric materials each comprise a thermoplastic polyurethane elastomer.

23. The method of claim 15, wherein the hard inner polymer layer comprises a blend of polymeric materials including the co-polyester and one or more of: a polyester, a thermoplastic polyurethane, a polypropylene, a polyethylene, a polypropylene and polyethylene copolymer, an acrylic, a polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a cyclic block copolymer, a polyethersulfone, a polytrimethylene terephthalate, or a combination thereof.

24. The method of claim 15, wherein the hard inner polymer layer comprises at least two layers including a first layer comprising the co-polyester and a second layer comprising one or more of: a polyester, a co-polyester, a thermoplastic polyurethane, a polypropylene, a polyethylene, an acrylic, a

polyetheretherketone, a polyamide, a polyethylene terephthalate, a polybutylene terephthalate, a polyetherimide, a cyclic block copolymer, a polyethersulfone, or a polytrimethylene terephthalate.

25. The method of claim 15, wherein the first soft outer polymer layer and the second soft outer polymer layer each independently comprise at least one of: an ultimate tensile strength of greater than about 5000 psi, an elongation at break of greater than about 200%, a compression set at about 70 °C of greater than 40% after 24 hours, or a light transmission between 400 nm and 800 nm of greater than about 75%.

26. The method of claim 15, further comprising fabricating the removable orthodontic tooth positioning appliance.

27. A method of moving a patient's teeth from an initial configuration to a target configuration, the method comprising the steps of:

providing a removable orthodontic tooth positioning appliance having teeth receiving cavities shaped to directly receive at least some of a patient's teeth;

applying a resilient positioning force to the patient's teeth; and

moving the teeth into the target configuration, wherein the appliance comprises:

a first soft outer polymer layer comprising a first soft polymeric material and a second soft outer polymer layer comprising a second soft polymeric material, each of the first and second soft polymer layers having a hardness of about 60A to about 85D, and a thickness in a range from 25 μ m to 100 μ m; and

a hard inner polymer layer comprising a co-polyester disposed between the first soft outer polymer layer and the second soft outer polymer layer so as to reduce degradation of the resilient positioning force applied to the teeth when the appliance is worn.

28. The method of claim 27, wherein the first and second soft polymeric material each respectively comprise a material selected from the group consisting of: a thermoplastic polyurethane elastomer, a silicone rubber, an elastomeric alloy, a thermoplastic elastomer (TPE), a thermoplastic vulcanizate (TPV) elastomer, a block copolymer elastomer, a polyolefin blend elastomer, a thermoplastic co-polyester elastomer, a thermoplastic polyamide elastomer, or a combination thereof.

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ASSIGNMENT

WHEREAS I, I) Craig Pehlert
of 1) 29 St. Ann's Avenue, Lenox, MA 01240
have invented certain improvements in MULTILAYER DENTAL APPLIANCES AND RELATED
METHODS AND SYSTEMS
described in a patent application executed by me and identified in the United States Patent Office as follows:
Serial No.: 13/470,681
Filed: May 14, 2012
and Attorney's Docket No.: 22773-826.201; and

WHEREAS, COVESTRO LLC, of Pittsburgh, Pennsylvania, a limited liability company of the State of Delaware is desirous of acquiring the entire right, title and interest in and to said invention or inventions and any and all patents to be obtained therefore; this document may be executed in any number of counterparts, each of which so executed shall be deemed to be an original, but all such counterparts shall together constitute but one and the same document.

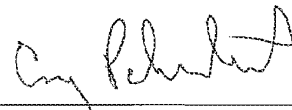
NOW, THEREFORE, for valuable consideration and in accordance with the obligations in my employment contracts with COVESTRO LLC, I do hereby sell, assign and transfer unto said COVESTRO LLC, its successors and assigns, the entire right, title, and interest in and to said invention or inventions, as described in the aforesaid application, in any form or embodiment thereof, and in and to the aforesaid application; and in and to any applications filed in any foreign country based thereon, including the right to file said foreign applications under the provisions of the International Convention; also any improvements on said invention or inventions now or hereafter made by me during the period of my employment; also the entire right, title and interest in and to any and all patents or reissues or extensions thereof to be obtained in this or any foreign country upon said invention, inventions or improvements and any divisional, continuation, continuation-in-part or substitute applications which may be filed upon said invention, inventions or improvements in this or any foreign country; and I hereby authorize and request the issuing authority to issue any and all patents on said application or applications to said COVESTRO LLC, as assignee of the entire interest.

I further agree, without any payment by COVESTRO LLC, other than expenses incurred by the undersigned, to communicate to said COVESTRO LLC, its representatives or agents, any facts relating to said invention, inventions or improvements, including evidence for interference purposes or for other legal proceedings, whenever requested, testify in any interference or other legal proceedings, whenever requested; and execute and deliver, on request, all lawful papers required to make any of the foregoing provisions effective.

SIGNED AT Sheffield, Massachusetts, USA.

2/17/2017
(Date)

(L.S.) I)


Craig Pehlert

/vjt/pehlertassignmentalign21617

ASSIGNMENT

WHEREAS We, 1) Dr. Heinz Pudleiner; 2) Klaus Meyer; 3) Joerg Nickel
of 1) Bethelstr. 39, 47800 Krefeld, Germany; 2) Kamillenstr. 40, 41539 Dormagen, Germany;
3) Krokusweg 2, 41539 Dormagen, Germany
have invented certain improvements in MULTILAYER DENTAL APPLIANCES AND RELATED METHODS AND SYSTEMS

described in a patent application executed by us and identified in the United States Patent Office as follows:

Serial No.: 13/470,681

Filed: May 14, 2012

and Attorney's Docket No.: 22773-826,201; and

WHEREAS, COVESTRO DEUTSCHLAND AKTIENGESELLSCHAFT, of Leverkusen, Germany, a corporation of Germany, is desirous of acquiring the entire right, title and interest in and to said invention or inventions and any and all patents to be obtained therefore; this document may be executed in any number of counterparts, each of which so executed shall be deemed to be an original, but all such counterparts shall together constitute but one and the same document.

NOW, THEREFORE, for valuable consideration and in accordance with the obligations in our employment contract with COVESTRO DEUTSCHLAND AKTIENGESELLSCHAFT, we do hereby sell, assign and transfer unto said COVESTRO DEUTSCHLAND AKTIENGESELLSCHAFT, their successors and assigns, the entire right, title, and interest in and to said invention or inventions, as described in the aforesaid application, in any form or embodiment thereof, and in and to the aforesaid application; and in and to any applications filed in any foreign country based thereon, including the right to file said foreign applications under the provisions of the International Convention; also any improvements on said invention or inventions now or hereafter made by us during the period of our employment; also the entire right, title and interest in and to any and all patents or reissues or extensions thereof to be obtained in this or any foreign country upon said invention, inventions or improvements and any divisional, continuation, continuation-in-part or substitute applications which may be filed upon said invention, inventions or improvements in this or any foreign country we hereby authorize and request the issuing authority to issue any and all patents on said application or applications to said COVESTRO DEUTSCHLAND AKTIENGESELLSCHAFT, as assignees of the entire interest.

We further agree, without any payment by COVESTRO DEUTSCHLAND AKTIENGESELLSCHAFT, other than expenses incurred by the undersigned, to communicate to said COVESTRO DEUTSCHLAND AKTIENGESELLSCHAFT, their representatives or agents, any facts relating to said invention, inventions or improvements, including evidence for interference purposes or for other legal proceedings, whenever requested, testify in any interference or other legal proceedings, whenever requested; and execute and deliver, on request, all lawful papers required to make any of the foregoing provisions effective.

SIGNED AT DORMAGEN, Germany,

23.02.2017

(Date)

L.S.) 1)

Dr. Heinz Pudleiner
Dr. Heinz Pudleiner

SIGNED AT Dormagen, Germany,

22.2.2017

(Date)

L.S.) 2)

Klaus Meyer
Klaus Meyer

SIGNED AT Dormagen, Germany,

22.02.2017

(Date)

L.S.) 3)

Joerg Nickel
Joerg Nickel

/s/jt/27773assignmentgermaninventors

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		MULTILAYER POLYMER SHEETS		
First Named Inventor/Applicant Name:		Chunhua LI		
Filer:		Garrett T Potter/Selena Whitaker-Paquet		
Attorney Docket Number:		22773-826.311		
Filed as Large Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4200	4200
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	10	100	1000
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous-Filing:				
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				7640

Electronic Acknowledgement Receipt

EFS ID:	46546547
Application Number:	17902445
International Application Number:	
Confirmation Number:	3552
Title of Invention:	MULTILAYER POLYMER SHEETS
First Named Inventor/Applicant Name:	Chunhua LI
Customer Number:	107046
Filer:	Garrett T Potter/Selena Whitaker-Paquet
Filer Authorized By:	Garrett T Potter
Attorney Docket Number:	22773-826.311
Receipt Date:	02-SEP-2022
Filing Date:	
Time Stamp:	15:45:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$7640
RAM confirmation Number	E202292F45563188
Deposit Account	232415
Authorized User	Selena Whitaker-Paquet
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges) 37 CFR 1.16 (National application filing, search, and examination fees)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	22773_826_311_exAppln_TRN SMTL.pdf	218578	no	1
			c69cca5d7f077e91c83797580606e952fa080060		
Warnings:					
Information:					
2	Track One Request	22773_826_311_exREQ_Prioritized_Exam_TRACK_1.pdf	109003	no	1
			e96dda4bf19d7844bfa649da380845a5bba646c2		
Warnings:					
Information:					
3	Application Data Sheet	22773_826_311_exADS.pdf	2197214	no	10
			98cd7e48678b44ac02de3de803248aedde66598f		
Warnings:					
Information:					
4		22773_826_311_Spec_Claims_Abstract_09_01_2022.pdf	211733	yes	17
			e54f48393225a7679c1492ae422398343fc05c92		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	12	
	Claims		13	16	
	Abstract		17	17	
Warnings:					
Information:					
5	Drawings-only black and white line drawings	22773_826_311_Drawings.pdf	2428305	no	8
			35ec54d84da8f0f0605db8cd6b2c258685be094		

Warnings:					
Information:					
6	Oath or Declaration filed	22773_826_311_Parent401_exl nv_Declarations.pdf	722929 4160be948dbecd374161858ce95c7981e f84fe	no	6
Warnings:					
Information:					
7	Power of Attorney	22773_Gen_POA.pdf	807616 d8bac50de0e1b0100fda6bc3e3ddad956 f63ef	no	1
Warnings:					
Information:					
8	Assignee showing of ownership per 37 CFR 3.73	22773_826_311_exStmnt_Und er_3_73c.pdf	14077425 7b720fc3938484789e0f52a6b4b74e606a7 b1788	no	16
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	55201 491dbfde71d751097b2f25d8f30e6f3d049a 6eb3	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			20828004		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 17/902,445			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800		
TOTAL CLAIMS (37 CFR 1.16(i))	30	minus 20 = 10				x 100 =	1000		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4	minus 3 = 1				x 480 =	480		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0		
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0		
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL	2300		
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
				TOTAL ADD'L FEE			TOTAL ADD'L FEE		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
				TOTAL ADD'L FEE			TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									





UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
17/902,445	09/02/2022		3300	22773-826.311	30	4

CONFIRMATION NO. 3552

FILING RECEIPT



0000000048813468

107046

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

Date Mailed: 09/22/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Chunhua LI, Cupertino, CA;
Yan CHEN, Cupertino, CA;
Heinz PUDLEINER, Krefeld, GERMANY;
Klaus MEYER, Dormagen, GERMANY;
Joerg NICKEL, Dormagen, GERMANY;
Craig PEHLERT, Lenox, MA;

Applicant(s)

ALIGN TECHNOLOGY, INC., San Jose, CA;

Power of Attorney: The patent practitioners associated with Customer Number 107046

Domestic Priority data as claimed by applicant

This application is a CON of 17/858,825 07/06/2022
which is a CON of 17/553,590 12/16/2021
which is a CON of 16/835,101 03/30/2020 PAT 11,213,369
which is a CON of 15/476,655 03/31/2017 PAT 10,973,613
which is a DIV of 13/470,681 05/14/2012 PAT 9,655,691

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Projected Publication Date: 12/29/2022

Non-Publication Request: No

Early Publication Request: No
Title

MULTILAYER POLYMER SHEETS

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/902,445	09/02/2022	Chunhua LI	22773-826.311

107046

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

CONFIRMATION NO. 3552

NEW OR REVISED PPD NOTICE



NOTICE OF NEW OR REVISED PROJECTED PUBLICATION DATE

The above-identified application has a new or revised projected publication date. The current projected publication date for this application is 12/29/2022. If this is a new projected publication date (there was no previous projected publication date), the application has been cleared by Licensing & Review or a secrecy order has been rescinded and the application is now in the publication queue.

If this is a revised projected publication date (one that is different from a previously communicated projected publication date), the publication date has been revised due to processing delays in the USPTO or the abandonment and subsequent revival of an application. The application is anticipated to be published on a date that is more than six weeks different from the originally-projected publication date.

More detailed publication information is available through the private side of Patent Application Information Retrieval (PAIR) System. The direct link to access PAIR is currently <http://pair.uspto.gov>. Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Questions relating to this Notice should be directed to the Office of Data Management, Application Assistance Unit at (571) 272-4000, or (571) 272-4200, or 1-888-786-0101.

I hereby certify that this correspondence is being filed via
EFS-Web with the United States Patent and Trademark Office

Attorney Docket No.: 22773-826.311

on October 3, 2022

WILSON SONSINI GOODRICH & ROSATI

By: /Selena Whitaker-Paquet/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Chunhua LI, et al.

Application No.: 17/902,445

Filed: September 2, 2022

For: MULTILAYER POLYMER SHEETS

Customer No. 107046

Confirmation No.: 3552

Examiner: Unassigned

Art Unit: Unassigned

REQUEST FOR CORRECTED FILING RECEIPT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

It has come to our attention that the Foreign Filing License statement, "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date, does not appear on the Filing Receipt mailed 09/22/2022 on behalf of the subject patent application. It is our understanding that the USPTO has confirmed that this omission was due to a software error on the part of the USPTO and it is believed the error has been resolved. A copy of the Filing Receipt with corrections noted thereon is enclosed.

No fees are due for this Request; however, the Commissioner is hereby authorized to charge any fees in connection with this paper to Deposit Account No. 23-2415.

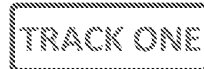
Issuance of a corrected Filing Receipt is respectfully requested.

Respectfully submitted,

Dated: October 3, 2022

/Yahn Lin CHU/
Yahn Lin CHU
Registration No. 75,946

WILSON SONSINI GOODRICH & ROSATI
650 Page Mill Road
Palo Alto, CA 94304-1050
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
17/902,445	09/02/2022		3300	22773-826.311	30	4

CONFIRMATION NO. 3552

FILING RECEIPT



0000000048613468

107046

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

Date Mailed: 09/22/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Chunhua LI, Cupertino, CA;
Yan CHEN, Cupertino, CA;
Heinz PUDLEINER, Krefeld, GERMANY;
Klaus MEYER, Dormagen, GERMANY;
Joerg NICKEL, Dormagen, GERMANY;
Craig PEHLERT, Lenox, MA;

Applicant(s)

ALIGN TECHNOLOGY, INC., San Jose, CA;

Power of Attorney: The patent practitioners associated with Customer Number 107046

Domestic Priority data as claimed by applicant

This application is a CON of 17/858,825 07/06/2022
which is a CON of 17/553,590 12/16/2021
which is a CON of 16/835,101 03/30/2020 PAT 11,213,369
which is a CON of 15/476,655 03/31/2017 PAT 10,973,613
which is a DIV of 13/470,681 05/14/2012 PAT 9,655,691

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, License Granted: XX/XX/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 17/902,445

Projected Publication Date: 12/29/2022

Non-Publication Request: No

Early Publication Request: No

Title

MULTILAYER POLYMER SHEETS

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

Electronic Acknowledgement Receipt	
EFS ID:	46746207
Application Number:	17902445
International Application Number:	
Confirmation Number:	3552
Title of Invention:	MULTILAYER POLYMER SHEETS
First Named Inventor/Applicant Name:	Chunhua LI
Customer Number:	107046
Filer:	Yahn Lin Chu/Selena Whitaker-Paquet
Filer Authorized By:	Yahn Lin Chu
Attorney Docket Number:	22773-826.311
Receipt Date:	03-OCT-2022
Filing Date:	02-SEP-2022
Time Stamp:	20:30:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	22773_826_311_exTRNSMTL.pdf	206098	no	1
			e047534925e021a49ec189f492964c520e5d359d		

Warnings:

Information:					
2	Request for Corrected Filing Receipt	22773_826_311_exREQ_Corrected_Filing_Receipt.pdf	83539 3d0898ba5a0574cc81d49e00b18e03e573547268	no	1
Warnings:					
Information:					
3	Request for Corrected Filing Receipt	22773_826_311_Filing_Receipt_Marked.pdf	3078693 4eaf7c1a764f11419d3da3347f66215d48ee402b	no	4
Warnings:					
Information:					
Total Files Size (in bytes):			3368330		
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TRANSMITTAL FORM <i>(to be used for all correspondence after initial filing)</i>	Application Number	17/902,445	
	Filing Date	September 2, 2022	
	First Named Inventor	Chunhua LI, et al.	
	Art Unit	Unassigned	
	Examiner Name	Unassigned	
Total Number of Pages in This Submission	6	Attorney Docket Number	22773-826.311

ENCLOSURES (Check all that apply)		
☐ Fee Transmittal Form ☐ Fee Attached ☐ Amendment/Reply ☐ After Final ☐ Affidavits/declaration(s) ☐ Extension of Time Request ☐ Express Abandonment Request ☐ Information Disclosure Statement ☐ Certified Copy of Priority Document(s) ☐ Reply to Missing Parts/Incomplete Application ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53	☐ Drawing(s) ☐ Licensing-related Papers ☐ Petition ☐ Petition to Convert to a Provisional Application ☐ Power of Attorney, Revocation ☐ Change of Correspondence Address ☐ Terminal Disclaimer ☐ Request for Refund ☐ CD, Number of CD(s) _____ ☐ Landscape Table on CD	☐ After Allowance Communication to TC ☐ Appeal Communication to Board of Appeals and Interferences ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) ☐ Proprietary Information ☐ Status Letter ☒ Other Enclosure(s) (please identify below): Request for Corrected Filing Receipt; and Copy of Filing Receipt mailed 09/22/2022
Remarks		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	WILSON SONSINI GOODRICH & ROSATI		
Signature	/Yahn Lin CHU/		
Printed name	Yahn Lin CHU		
Date	October 3, 2022	Reg. No.	75,946

CERTIFICATE OF TRANSMISSION/MAILING			
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Signature	/Selena Whitaker-Paquet/		
Typed or printed name	Selena WHITAKER-PAQUIET	Date	October 3, 2022

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
17/902,445	09/02/2022	OPAP	7640	22773-826.311	30	4

107046

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

CONFIRMATION NO. 3552
CORRECTED FILING RECEIPT



0000000049826598

Date Mailed: 10/18/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Chunhua LI, Cupertino, CA;
Yan CHEN, Cupertino, CA;
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Applicant(s)

ALIGN TECHNOLOGY, INC., San Jose, CA;

Power of Attorney: The patent practitioners associated with Customer Number 107046

Domestic Priority data as claimed by applicant

This application is a CON of 17/858,825 07/06/2022
which is a CON of 17/553,590 12/16/2021
which is a CON of 16/835,101 03/30/2020 PAT 11,213,369
which is a CON of 15/476,655 03/31/2017 PAT 10,973,613
which is a DIV of 13/470,681 05/14/2012 PAT 9,655,691

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/20/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/902,445**

Projected Publication Date: 12/29/2022

Non-Publication Request: No

Early Publication Request: No
Title

MULTILAYER POLYMER SHEETS

Preliminary Class

428

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552
107046	7590	10/25/2022	EXAMINER	
Align Technology, Inc. / WSGR			CENTRAL, DOCKET	
650 Page Mill Road			ART UNIT	
Palo Alto, CA 94304			PAPER NUMBER	
			OPAP	
			NOTIFICATION DATE	
			DELIVERY MODE	
			10/25/2022	
			ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

<i>Decision Granting Request for Prioritized Examination (Track I)</i>	Application No. 17/902,445	Applicant(s) LI et al.	
	Examiner FIKIRTE A GEREMEW	Art Unit OMBL	AIA (FITF) Status Yes
1. THE REQUEST FILED <u>02 September 2022</u> IS GRANTED . The above-identified application has met the requirements for prioritized examination A. ☒ for an original nonprovisional application (Track I). B. ☐ for an application undergoing continued examination (RCE). 2. The above-identified application will undergo prioritized examination. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs: A. filing a <u>petition for extension of time</u> to extend the time period for filing a reply; B. filing an <u>amendment to amend the application to contain more than four independent claims, more than thirty total claims</u>, or a multiple dependent claim; C. filing a <u>request for continued examination</u> ; D. filing a notice of appeal; E. filing a request for suspension of action; F. mailing of a notice of allowance; G. mailing of a final Office action; H. completion of examination as defined in 37 CFR 41.102; or I. abandonment of the application. Telephone inquiries with regard to this decision should be directed to FIKIRTE GEREMEW at (703) 756-1930. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.			
/FIKIRTE A GEREMEW/ PROGRAM SUPPORT ASSISTANT, OMBL			



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552
107046	7590	11/25/2022	EXAMINER	
Align Technology, Inc. / WSGR			CHEN, VIVIAN	
650 Page Mill Road			ART UNIT	
Palo Alto, CA 94304			PAPER NUMBER	
			1787	
			NOTIFICATION DATE	
			DELIVERY MODE	
			11/25/2022	
			ELECTRONIC	

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The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

DETAILED ACTION

Status of Claims

1. Claims 1-30 is/are pending.
2. Claims 1-30 is/are rejected.

Notice of Pre-AIA or AIA Status

3. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

Priority

5. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, 365(c), or 386(c) is acknowledged. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent application and in the later-

filed application must be sufficient to comply with the requirements of 35 U.S.C. 112(a) or the first paragraph of pre-AIA 35 U.S.C. 112, except for the best mode requirement. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994)

The disclosure of the prior-filed applications, Application Nos. 13/470,681 and 15/476,655 and 16/835,101 fails to provide adequate support or enablement in the manner provided by 35 U.S.C. 112(a) or pre-AIA 35 U.S.C. 112, first paragraph for one or more claims of this application.

The originally filed disclosures of Application Nos. 13/470,681 (filed 05/14/2012) and 15/476,655 (filed 03/31/2017) and 16/835,101 (filed 03/30/2020) only provides support for:

- (1) **layers as a whole** having specific physical properties (e.g., flexural modulus, elongation at break, etc.);
- (2) **layers as a whole** having elastic modulus which are greater than the elastic modulus of other **layers as a whole**.

However, the originally filed disclosures of Application Nos. 13/470,681 and 15/476,655 and 16/835,101 do **NOT** provide support for:

- (1) **polymers** themselves (e.g., copolyesters; thermoplastic polyurethane elastomers) having specific physical properties (e.g., flexural modulus, elongation at break, etc.);
- (2) **polymers** themselves (e.g., copolyesters) having an elastic modulus which are greater than the elastic modulus of other **polymers**. (e.g., thermoplastic polyurethane elastomers).

Since in the originally filed claims, a **layer as a whole** can contain other components other than the recited polymer, this means that the recited polymer in said layer does not inherently have the same physical properties as the **layer as a whole**. Similarly, the recited polymer in said layer does not inherently have the same elastic modulus as the **layer as a whole**.

Application 17/553,590 (filed 12/16/2021) provides support for: (1) polymers having specific physical properties; and (2) polymers having an elastic modulus which is greater than the elastic modulus of other polymers. However, Application 17/553,590 does **not** provide support for thermoplastic polyurethane elastomers having a flexural modulus of greater than 35,000 psi.

Application 17/858,825 (filed 07/06/2022) provides support for: (1) copolyesters and thermoplastic polyurethane elastomers having specific physical properties; and (2) a copolyester having an elastic modulus greater than the elastic modulus of a thermoplastic polyurethane elastomer.

Therefore, if the language of the present claims is interpreted as requiring the polymers themselves to have specific physical properties and elastic modulus values, claims 1-30 have (at best) an effective priority date of **07/06/2022**.

However, if the language of the present claims is interpreted as requiring the layers **as a whole** to have specific physical properties and elastic modulus values, claims 1-30 have an effective filing date of **05/14/2012**.

Claim Rejections - 35 USC § 112

6. The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-30 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claims 1, 6, 10-12, 20 are vague and indefinite because it is unclear whether it is the first layer (as a whole) which has the recited properties, or whether it is the co-polyester which has the recited properties.

Claim 1, 6, 10-12, 20 are vague and indefinite because it is unclear whether the second layer (as a whole) which has the recited properties, or whether it is the thermoplastic polyurethane elastomer which has the recited properties.

Claims 2-5, 7-9, 13-19, 21-30 are dependent on one or more of the above claims and therefore incorporate the above-described indefinite subject matter.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van*

Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

9. Claims 1-30 is/are rejected on the ground of nonstatutory double patenting as being unpatentable over:

- claims 1-31 of U.S. Patent No. 9,655,691 (LI ET AL); or
- claims 1-20 of U.S. Patent No. 9,655,693 (LI ET AL); or

- claims 1-27 of U.S. Patent No. 10,052,176 (LI ET AL); or
- claims 1-22 of U.S. Patent No. 10,973,613 (LI ET AL).

in view of TADROS ET AL (US 2005/0100853).

The above U.S. Patents each claim a dental appliance for repositioning a patient's teeth, wherein the appliance comprises a multilayer film, or methods related to said multilayer film, wherein the multilayer film comprises:

- a first soft outer layer comprising a thermoplastic polyurethane (TPU) elastomer (corresponding to the recited "second layer"), wherein the first soft outer layer has physical properties (e.g., flexural modulus, ultimate tensile strength, elongation at break, hardness, compression set, etc.) as recited in present application claims 1, 6, 10-11, 20, 25, 28, etc.;
- a hard inner layer comprising a copolyester, wherein the hard inner layer has physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in present application claims 1, 4, 6, 10-12, 20, 26, 29, etc., wherein the hard inner layer is optionally formed from:
 - a first hard sub-layer comprising a copolyester (corresponding to the recited "first layer");
 - a second hard sub-layer comprising a copolyester (corresponding to the recited "third layer");
- a second soft outer layer comprising thermoplastic polyurethane (TPU) elastomer (corresponding to the recited "fourth layer");

Features not explicitly claimed in the above U.S. Patents are known in the prior art.

TADROS ET AL '853 discloses that it is well known in the art to form dental appliances for adjusting the alignment of a patient's teeth, wherein the appliance is formed from a multilayer sheet comprising:

- a first elastomer layer (e.g., containing polyurethane elastomer);
- a copolyester layer (e.g., containing polyethylene terephthalate copolymerized with cyclohexanedimethanol (PETG), etc.);

- a second elastomer layer (e.g., containing polyurethane elastomer).

(paragraph 0015, 0019, 0022-0023, 0067, 0073, 0087-0088, etc.)

Regarding claims 1-30, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to utilize a multilayer sheet comprising a soft outer layer containing TPU elastomer on one or both sides of a hard inner layer containing copolyester as claimed in U.S. Patent Nos. 9,655,691 and 9,655,693 and 10,052,176 and 10,973,613 in a known dental appliance production method as disclosed in TADROS ET AL '853 in order to produce useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

Further regarding claims 1, 4, 6, 10-12, 20, 25-26, 28-29, one of ordinary skill in the art would have utilized: (i) TPU elastomers having physical properties which are substantially similar to the desired physical properties of the soft outer layer(s); and (ii) copolyesters having physical properties which are substantially similar to the desired physical properties of the hard inner layer(s); in the multilayer materials as claimed in U.S. Patent Nos. 9,655,691 and 9,655,693 and 10,052,176 and 10,973,613 in order to simplify the production of dental appliances with specific overall physical mechanical properties.

Further regarding claims 1, 9, 19, 30, since the elastic modulus is a measure of the rigidity or stiffness of a material, one of ordinary skill in the art would have utilized a relatively lower elastic modulus material to form soft outer layer(s) in the multilayer materials claimed in U.S. Patent Nos. 9,655,691 and 9,655,693 and 10,052,176 and 10,973,613 in order to provide desirably compliant or resilient outer layer(s) which conform well to a patient's teeth (thereby

avoiding localized force which might damage teeth) and optionally to provide comfortable mouth-containing surfaces.

Further regarding claims 1, 9, 19, 30, since the elastic modulus is a measure of the rigidity or stiffness of a material, one of ordinary skill in the art would have utilized a relatively higher elastic modulus material to form hard inner layer(s) in the multilayer materials claimed in U.S. Patent Nos. 9,655,691 and 9,655,693 and 10,052,176 and 10,973,613 in order to provide desirably “hard” or stiff inner layer(s) which provide the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Regarding claims 2-3, 7-8, 13, 16-17, 23, one of ordinary skill in the art would have used two copolyester sub-layers to form the hard inner layer in the multilayer material claimed in U.S. Patent Nos. 9,655,691 and 9,655,693 and 10,052,176 and 10,973,613 in order to produce a 4-layer multilayer material which allows for convenient optimization of various performance properties (strength, thermoforming properties, rigidity, flexibility, etc.) in the hard inner layer and the dental appliance for specific applications and/or usage conditions.

Regarding claims 2-3, 7-8, 13, 16-18, 22-23, one of ordinary skill in the art would have positioned a soft layer on both sides of a single hard layer or a multilayer hard layer in order to provide useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

* * *

10. Claims 1-30 is/are rejected on the ground of nonstatutory double patenting as being unpatentable over:

- claims 1-30 of U.S. Patent No. 11,154,384 (LI ET AL);
- in view of TADROS ET AL (US 2005/0100853),
- and in view of DESIMONE ET AL (US 2006/0078841).

The above U.S. Patent claims a dental appliance for repositioning a patient's teeth, wherein the appliance comprises a multilayer film with three or more layers, wherein the multilayer film comprises:

- at least one soft layer comprising a thermoplastic polyurethane (TPU) elastomer (corresponding to the recited "second layer" and optionally the recited "fourth layer"), wherein the soft layer(s) has physical properties (e.g., flexural modulus, tensile strength at yield, elongation at break, hardness, compression set, etc.) as recited in present application claims 1, 6, 10-11, 20, 25, 28, etc., wherein the soft layer(s) have an elastic modulus which is less than the elastic modulus of the hard layer;
- at least one hard layer comprising a copolyester (corresponding to the recited "second layer" and optionally the recited "third layer"), wherein the hard layer(s) have physical properties (e.g., flexural modulus, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in present application claims 1, 4, 6, 10-12, 20, 26, 29, etc., wherein the hard inner layer is optionally formed from:

Features not explicitly claimed in the above U.S. Patent are known in the prior art.

TADROS ET AL '853 discloses that it is well known in the art to form dental appliances for adjusting the alignment of a patient's teeth, wherein the appliance is formed from a multilayer sheet comprising:

- a first elastomer layer (e.g., containing polyurethane elastomer);
- a copolyester layer (e.g., containing polyethylene terephthalate copolymerized with cyclohexanedimethanol (PETG), etc.);
- a second elastomer layer (e.g., containing polyurethane elastomer).

(paragraph 0015, 0019, 0022-0023, 0067, 0073, 0087-0088, etc.)

DESIMONE ET AL '841 discloses that it is well known in the art to use copolyesters having physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in the present application claims as components in dental appliances (e.g., appliances for repositioning a patient's teeth). (paragraph 0023, 0027, 0030, 0044, etc.)

Regarding claims 1-30, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to utilize a multilayer sheet comprising a soft layer containing TPU elastomer on at least one side of a hard layer containing copolyester as claimed in U.S. Patent No. 11,154,384 in a known dental appliance production method as disclosed in TADROS ET AL '853 in order to produce useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

Further regarding claims 1, 4, 6, 10-12, 20, 25-26, 28-29, one of ordinary skill in the art would have utilized: (i) TPU elastomers having physical properties which are substantially similar to the desired physical properties of the soft outer layer(s); and (ii) copolyesters having physical properties which are substantially similar to the desired physical properties of the hard inner layer(s); in the multilayer materials as claimed in U.S. Patent No. 11,154,384 in order to simplify the production of dental appliances with specific overall physical mechanical properties.

Further regarding claim 1, 4, 6, 10-12, 20, 26, 29, one of ordinary skill in the art would have utilize known, commercially available copolyester materials having physical properties as recited in the present application claims as disclosed in DESIMONE ET AL '841 in the hard

layer(s) in the multilayer materials as claimed in U.S. Patent No. 11,154,384 in order to produce dental appliances with the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Regarding claims 2-3, 7-8, 13, 16-17, 23, one of ordinary skill in the art would have used two copolyester sub-layers to form the hard inner layer in the multilayer material claimed in U.S. Patent No. 11,154,384 in order to produce a 4-layer multilayer material which allows for convenient optimization of various performance properties (strength, thermoforming properties, rigidity, flexibility, etc.) in the hard inner layer and the dental appliance for specific applications and/or usage conditions.

Regarding claims 2-3, 7-8, 13, 16-18, 22-23, one of ordinary skill in the art would have positioned a soft layer on both sides of a single hard layer or a multilayer hard layer in order to provide useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

* * *

11. Claims 1-30 is/are **provisionally** rejected on the ground of nonstatutory double patenting as being unpatentable over:

- the pending claims of copending Application No. 16/043,065 (US 2019/0183611) (LI ET AL);

or

- the pending claims of copending Application No. 16/264,420 (U.S. 2019/0159870) (LI ET AL);

or

• the pending claims of copending Application No. 16/382,918 (US 2019/0231484) (LI ET AL);

in view of TADROS ET AL (US 2005/0100853),

and in view of DESIMONE ET AL (US 2006/0078841).

The above copending Applications each claim a dental appliance comprising a multilayer film, or methods related to said multilayer film, wherein the multilayer film comprises:

- a first soft outer polymer layer comprising thermoplastic polyurethane elastomer, wherein the first soft outer layer have physical properties (e.g., hardness, flexural modulus, elongation at break, tensile strength, etc.) as recited in present application claims 1, 6, 10-11, 20, 25, 28, etc.;
- a hard inner polymer layer comprising a copolyester, wherein the hard inner layers have various physical properties (e.g., flexural modulus, elongation at break, elongation at yield, tensile strength, tensile modulus, light transmission, etc.) as recited in present application claim 1, 4, 6, 10-12, 26, 29, etc.,
- an optional second outer polymer layer optionally comprising thermoplastic polyurethane elastomer (e.g., thermoplastic polyurethane elastomer as used in the first soft outer layer; etc.);

Features not explicitly claimed in the above copending Applications are known in the prior art.

TADROS ET AL '853 discloses that it is well known in the art to form dental appliances for adjusting the alignment of a patient's teeth, wherein the appliance is formed from a multilayer sheet comprising:

- a first elastomer layer (e.g., containing polyurethane elastomer);
- a copolyester layer (e.g., containing polyethylene terephthalate copolymerized with cyclohexanedimethanol (PETG), etc.);
- a second elastomer layer (e.g., containing polyurethane elastomer).

(paragraph 0015, 0019, 0022-0023, 0067, 0073, 0087-0088, etc.)

DESIMONE ET AL '841 discloses that it is well known in the art to use copolyesters having physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in the present application claims, as components in dental appliances (e.g., appliances for repositioning a patient's teeth). (paragraph 0023, 0027, 0030, 0044, etc.)

Regarding claims 1-30, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to utilize a multilayer sheet comprising soft outer layers containing TPU elastomer on both sides of a hard inner layer containing copolyester as claimed in copending Application Nos. 16/043,065 and 16/264,420 and 16/382,918 in a known dental appliance production method as disclosed in TADROS ET AL '853 in order to produce useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

Further regarding claims 1, 9, 19, 30, since the elastic modulus is a measure of the rigidity or stiffness of a material, one of ordinary skill in the art would have utilized a relatively lower elastic modulus material to form soft outer layer(s) in the multilayer materials claimed in copending Application Nos. 16/043,065 and 16/264,420 and 16/382,918 in order to provide desirably compliant or resilient outer layer(s) which conform well to a patient's teeth (thereby avoiding localized force which might damage teeth) and optionally to provide comfortable mouth-containing surfaces.

Further regarding claims 1, 9, 19, 30, since the elastic modulus is a measure of the rigidity or stiffness of a material, one of ordinary skill in the art would have utilized a relatively

higher elastic modulus material to form hard inner layer(s) in the multilayer materials claimed in copending Application Nos. 16/043,065 and 16/264,420 and 16/382,918 in order to provide desirably “hard” or stiff inner layer(s) which provide the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Further regarding claims 1, 4, 6, 10-12, 20, 25-26, 28-29, one of ordinary skill in the art would have utilized: (i) TPU elastomers having physical properties which are substantially similar to the desired physical properties of the soft outer layer(s); and (ii) copolyesters having physical properties which are substantially similar to the desired physical properties of the hard inner layer(s); in the multilayer materials as claimed in copending Application Nos. 16/043,065 and 16/264,420 and 16/382,918 in order to simplify the production of dental appliances with specific overall physical mechanical properties.

Further regarding claims 1, 4, 6, 10-12, 20, 26, 29, one of ordinary skill in the art would have utilize known, commercially available copolyester materials having physical properties as recited in the present application claims as disclosed in DESIMONE ET AL ‘841 in the hard layer(s) in the multilayer materials as claimed in copending Application Nos. 16/043,065 and 16/264,420 and 16/382,918 in order to produce dental appliances with the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Regarding claims 2-3, 7-8, 13, 16-17, 23, one of ordinary skill in the art would have used two copolyester sub-layers to form the hard inner layer in the multilayer materials claimed in copending Application Nos. 16/043,065 and 16/264,420 and 16/382,918 in order to optimize the strength, thermoforming properties, and/or rigidity (or flexibility) of the dental appliance for specific applications and/or usage conditions.

Regarding claims 2-3, 7-8, 13, 16-18, 22-23, one of ordinary skill in the art would have positioned a soft layer on both sides of a single hard layer or a multilayer hard layer in order to provide useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

This is a **provisional** nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

* * *

12. Claims 10-26, 28-30 is/are **provisionally** rejected on the ground of nonstatutory double patenting as being unpatentable over:

- the pending claims of copending Application No. 17/553,590 (LI ET AL) (US 2022/0287803);

in view of TADROS ET AL (US 2005/0100853),

and in view of DESIMONE ET AL (US 2006/0078841).

The above copending Application claims a dental appliance comprising a multilayer film, or methods related to said multilayer film, wherein the multilayer film comprises:

- a second layer comprising a thermoplastic polyurethane (TPU) elastomer (corresponding to the recited “second layer”), wherein the first soft outer layer has physical properties (e.g., hardness, elongation at break, tensile strength, etc.) as recited in present application claims 1, 6, 10-11, 20, 25, 28, etc.;
- a first layer comprising a copolyester (corresponding to the recited “first layer”), wherein the first layer has physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in present application claims 1, 4, 6, 10-12, 20, 26, 29, etc.;

- a third layer comprising a copolyester (corresponding to the recited “third layer”);
- a fourth layer comprising thermoplastic polyurethane (TPU) elastomer (corresponding to the recited “fourth layer”);

wherein the copolyester of at least the first layer has an elastic modulus which is greater than the thermoplastic polyurethane elastomer in the soft outer polymer layers.

Features not explicitly claimed in the above U.S. copending Application are known in the prior art.

TADROS ET AL ‘853 discloses that it is well known in the art to form dental appliances for adjusting the alignment of a patient’s teeth, wherein the appliance is formed from a multilayer sheet comprising:

- a first elastomer layer (e.g., containing polyurethane elastomer);
- a copolyester layer (e.g., containing polyethylene terephthalate copolymerized with cyclohexanedimethanol (PETG), etc.);
- a second elastomer layer (e.g., containing polyurethane elastomer).

(paragraph 0015, 0019, 0022-0023, 0067, 0073, 0087-0088, etc.)

DESIMONE ET AL ‘841 discloses that it is well known in the art to use copolyesters having physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in the present application claims, as components in dental appliances (e.g., appliances for repositioning a patient’s teeth).

(paragraph 0023, 0027, 0030, 0044, etc.)

Regarding claims 1-30, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to utilize a multilayer sheet comprising soft outer layers containing TPU elastomer on both sides of a hard inner layer containing

copolyester as claimed in copending Application No. 17/553,590 in a known dental appliance production method as disclosed in TADROS ET AL '853 in order to produce useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

Further regarding claims 1, 4, 6, 10-12, 20, 25-26, 28-29, one of ordinary skill in the art would have utilized: (i) TPU elastomers having physical properties which are substantially similar to the desired physical properties of the soft outer layer(s); and (ii) copolyesters having physical properties which are substantially similar to the desired physical properties of the hard inner layer(s); in the multilayer materials as claimed in copending Application No. 17/553,590 in order to simplify the production of dental appliances with specific overall physical mechanical properties.

Further regarding claims 1, 4, 6, 10-12, 20, 26, 29, one of ordinary skill in the art would have utilize known, commercially available copolyester materials having physical properties as recited in the present application claims as disclosed in DESIMONE ET AL '841 in the hard layer(s) in the multilayer materials as claimed in copending Application No. 17/553,590 in order to produce dental appliances with the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Regarding claims 2-3, 7-8, 13, 16-17, 23, one of ordinary skill in the art would have used two copolyester sub-layers to form the hard inner layer in the multilayer materials claimed in copending Application No. 17/553,590 in order to optimize the strength, thermoforming properties, and/or rigidity (or flexibility) of the dental appliance for specific applications and/or usage conditions.

Regarding claims 2-3, 7-8, 13, 16-18, 22-23, one of ordinary skill in the art would have positioned a soft layer on both sides of a single hard layer or a multilayer hard layer in order to provide useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

This is a **provisional** nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

* * *

13. Claims 1-30 is/are **provisionally** rejected on the ground of nonstatutory double patenting as being unpatentable over:

- claims 1-30 of copending Application No. 17/858,825 (LI ET AL) (US 2022/0338957);
in view of TADROS ET AL (US 2005/0100853),
and in view of DESIMONE ET AL (US 2006/0078841).

The above copending Application claims a dental appliance comprising a multilayer film, or methods related to said multilayer film, wherein the multilayer film comprises:

- a second layer comprising a thermoplastic polyurethane (TPU) elastomer (corresponding to the recited “second layer”), wherein the first soft outer layer has physical properties (e.g., hardness, elongation at break, tensile strength, etc.) as recited in present application claims 1, 6, 10-11, 20, 25, 28, etc.;
- a first layer comprising a copolyester (corresponding to the recited “first layer”), wherein the first layer has physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in present application claims 1, 4, 6, 10-12, 20, 26, 29, etc.;
- a third layer comprising a copolyester (corresponding to the recited “third layer”);

- a fourth layer comprising thermoplastic polyurethane (TPU) elastomer (corresponding to the recited “fourth layer”);

wherein the copolyester of at least the first layer has an elastic modulus which is greater than the thermoplastic polyurethane elastomer in the soft outer polymer layers.

Features not explicitly claimed in the above U.S. copending Application are known in the prior art.

TADROS ET AL ‘853 discloses that it is well known in the art to form dental appliances for adjusting the alignment of a patient’s teeth, wherein the appliance is formed from a multilayer sheet comprising:

- a first elastomer layer (e.g., containing polyurethane elastomer);
- one or more copolyester layer(s) (e.g., containing polyethylene terephthalate copolymerized with cyclohexanedimethanol (PETG), etc.);
- a second elastomer layer (e.g., containing polyurethane elastomer).

(paragraph 0015, 0019, 0022-0023, 0067, 0073, 0087-0088, etc.)

DESIMONE ET AL ‘841 discloses that it is well known in the art to use copolyesters having physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in the present application claims as components in dental appliances (e.g., appliances for repositioning a patient’s teeth).

(paragraph 0023, 0027, 0030, 0044, etc.)

Regarding claims 1-30, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to utilize a multilayer sheet comprising soft outer layers containing TPU elastomer on both sides of a hard inner layer containing copolyester as claimed in copending Application No. 17/858,825 in a known dental appliance

production method as disclosed in TADROS ET AL '853 in order to produce useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

Further regarding claims 1, 4, 6, 10-12, 20, 25-26, 28-29, one of ordinary skill in the art would have utilized: (i) TPU elastomers having physical properties which are substantially similar to the desired physical properties of the soft outer layer(s); and (ii) copolyesters having physical properties which are substantially similar to the desired physical properties of the hard inner layer(s); in the multilayer materials as claimed in copending Application No. 17/858,825 in order to simplify the production of dental appliances with specific overall physical mechanical properties.

Further regarding claims 1, 4, 6, 10-12, 20, 26, 29, one of ordinary skill in the art would have utilize known, commercially available copolyester materials having physical properties as recited in the present application claims as disclosed in DESIMONE ET AL '841 in the hard layer(s) in the multilayer materials as claimed in copending Application No. 17/858,825 in order to produce dental appliances with the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Regarding claims 2-3, 7-8, 13, 16-17, 23, one of ordinary skill in the art would have used two copolyester sub-layers as suggested in TADROS ET AL '853 to form the hard inner layer in the multilayer materials claimed in copending Application No. 17/858,825 in order to optimize the strength, thermoforming properties, and/or rigidity (or flexibility) of the dental appliance for specific applications and/or usage conditions.

Regarding claims 2-3, 7-8, 13, 16-18, 22-23, one of ordinary skill in the art would have positioned a soft layer on both sides of a single hard layer or a multilayer hard layer in order to provide useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage).

This is a **provisional** nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claim Rejections - 35 USC § 103 (AIA)

14. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

15. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

16. Claims 10-26, 28-30 is/are rejected under 35 U.S.C. 103 as being unpatentable over:

TADROS ET AL (US 2005/0100853),
in view of DESIMONE ET AL (US 2006/0078841);
and in view of TEXIN 990R,
and in view of SHORE A HARDNESS SCALE,
and in view of KALILI (US 2011/0020761).

TADROS ET AL '853 discloses dental appliances for adjusting the alignment of a patent's teeth, wherein the appliance is formed from a multilayer sheet comprising:

- a first outer layer (e.g., containing polyurethane elastomer);
- one or more copolyester layer(s) (e.g., containing polyethylene terephthalate copolymerized with cyclohexanedimethanol (PETG), etc.);
- a second outer layer (e.g., containing polyurethane elastomer).

(entire document, e.g., paragraph 0015, 0019, 0022-0023, 0067, 0073, 0087-0088, etc.)

However, the reference does not specifically disclose copolyesters with the recited physical properties or polyurethane elastomer with the recited physical properties.

DESIMONE ET AL '841 discloses that it is well known in the art to use copolyesters having physical properties (e.g., flexural modulus, elongation at yield, tensile modulus, tensile strength at yield, elongation at break, light transmission, etc.) as recited in present application claims, etc., as components in dental appliances (e.g., appliances for repositioning a patient's teeth). (paragraph 0023, 0027, 0030, 0044, etc.)

TEXIN 990R discloses a commercially available thermoplastic polyurethane elastomer having physical properties (e.g., hardness, ultimate elongation, compression set, etc.) as recited in present application claims 16, 30-32, etc., with superior toughness, flexibility, microbial resistance. (page 1, 3, etc.)

SHORE A HARDNESS SCALE provides evidence that a material with a Shore A hardness of 90 exhibits a hardness which generally falls between Shore A 65 and Shore D 85.

KALILI '761 discloses that it is well known in the art to position "soft" layers with relatively lower elastic modulus on the tooth-contacting side of multilayer sheets used in dental appliances for repositioning a patient's teeth, in order to improve patient comfort, and also prevent tooth and/or root damage due to excessive localized stress. (paragraph 0002, 0007-0009, 0069-0072, etc.)

Regarding claims 10-26, 28-30, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to utilize known, commercially available copolyester materials having physical properties as recited in application claims 24-29 as disclosed in DESIMONE ET AL '841 as the copolyester layer(s) in the multilayer materials used to produce the dental appliances of TADROS ET AL '853 in order to produce dental appliances with the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Further regarding claims 10-26, 28-30, one of ordinary skill in the art would have utilized known relatively "soft" microbial resistant thermoplastic polyurethane elastomers as disclosed in TEXIN 990R as the first, tooth-contacting outer layer in the multilayer materials used to produce the dental appliances of TADROS ET AL '853 in order to produce repositioning dental appliances which minimize tooth and/or root damage associated with localized stress, as well as providing greater patient comfort.

Regarding claims 10-26, 28-30, one of ordinary skill in the art would have utilized known relatively "soft" microbial resistant thermoplastic polyurethane elastomers as disclosed in TEXIN 990R as the second, mouth-contacting outer layer in the multilayer materials used to

produce the dental appliances of TADROS ET AL '853 in order to provide useful dental aligning appliances with compliant mouth-contacting surfaces (to provide enhanced patient comfort during usage) as suggested in KALILI '761.

Further regarding claims 10-12, 20, 25-26, 28-29, one of ordinary skill in the art would have utilized: (i) TPU elastomers having physical properties which are substantially similar to the desired physical properties of the soft outer layer(s); and (ii) copolyesters having physical properties which are substantially similar to the desired physical properties of the hard inner layer(s); in the multilayer materials used to produce the dental appliances of TADROS ET AL '853 in order to simplify the production of dental appliances with specific overall physical mechanical properties.

Regarding claims 13, 16-17, 23, one of ordinary skill in the art would have used two copolyester sub-layers as suggested in TADROS ET AL '853 to form the hard inner layer in the multilayer materials used to produce the dental appliances of TADROS ET AL '853 in order to optimize the strength, thermoforming properties, and/or rigidity (or flexibility) of the dental appliance for specific applications and/or usage conditions.

Regarding claims 13, 16-18, 22-23, one of ordinary skill in the art would have positioned a soft layer on both sides of a single hard layer or a multilayer hard layer in order to provide useful dental aligning appliances with compliant teeth-containing surfaces (to provide uniform repositioning force across teeth surfaces) and optionally compliant mouth-contacting surfaces (to provide enhanced comfort during usage) as suggested in KALILI '761.

Further regarding claim 30, since the elastic modulus is a measure of the rigidity or stiffness of a material, one of ordinary skill in the art would have utilized a relatively lower elastic modulus material to form soft outer layer(s) in the multilayer materials used to produce

the dental appliances of TADROS ET AL '853 in order to provide desirably compliant or resilient outer layer(s) which conform well to a patient's teeth (thereby avoiding localized force which might damage teeth) and optionally to provide comfortable mouth-containing surfaces as suggested in KALILI '761.

Further regarding claim 30, since the elastic modulus is a measure of the rigidity or stiffness of a material, one of ordinary skill in the art would have utilized a relatively higher elastic modulus material to form hard inner layer(s) in the multilayer materials used to produce the dental appliances of TADROS ET AL '853 in order to provide desirably "hard" or stiff inner layer(s) which provide the required structural strength, shape-retention, as well as the necessary tooth-repositioning force for specific applications.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vivian Chen (Vivian.chen@uspto.gov) whose telephone number is (571) 272-1506. The examiner can normally be reached on Monday through Thursday from 8:30 AM to 6 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho, can be reached on (571) 272-1123. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

The General Information telephone number for Technology Center 1700 is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

November 19, 2022

/Vivian Chen/

Primary Examiner, Art Unit 1787

Notice of References Cited	Application/Control No. 17/902,445		Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN		Art Unit 1787	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20050100853-A1	05-2005	Tadros, Safwat	A61C19/063	433/6
*	B	US-20110020761-A1	01-2011	Kalili; Thomas	A61C7/08	433/214
*	C	US-20060078841-A1	04-2006	DeSimone; Joseph M.	A61C7/08	433/6
*	D	US-20050082703-A1	04-2005	Wrosz, Roman	B29C51/22	264/16
*	E	US-5335675-A	08-1994	Wheeler, deceased; Robert G.	B29C49/00	128/842
*	F	US-9655691-B2	05-2017	Li; Chunhua	B32B7/022	1/1
*	G	US-9655693-B2	05-2017	Li; Chunhua	B32B27/40	1/1
*	H	US-10052176-B2	08-2018	Li; Chunhua	A61C7/08	1/1
*	I	US-10973613-B2	04-2021	Li; Chunhua	B32B27/34	1/1
*	J	US-11154384-B2	10-2021	Li; Chunhua	B32B7/022	1/1
*	K	US-20190231484-A1	08-2019	Li; Chunhua	B32B25/20	1/1
*	L	US-20190183611-A1	06-2019	Li; Chunhua	B32B27/40	1/1
*	M	US-20190159870-A1	05-2019	Li; Chunhua	B32B27/40	1/1

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
*	U	"Overview of Materials for PETG Copolyester" (http://www.matweb.com/search/DataSheet.aspx?MatGUID=4de1c85bb946406a86c52b688e3810d0&ckck=1) (webpage retrieved on 10/27/2020) (Year: 2020)
*	V	"TEXIN 990R - Thermoplastic Polyurethane" (2002) (Year: 2002)
	W	"Shore A Hardness Scale" (https://www.cuttosize.com.au/technical-support/shore-hardness-scale/) (webpage retrieved 11/18/2022) (undated) (Year: 2022)
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20221119

Notice of References Cited	Application/Control No. 17/902,445		Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN		Art Unit 1787	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-7201575-B2	04-2007	Adell; Loren S.	A61C13/0001	433/80
*	B	US-20080248438-A1	10-2008	DeSimone; Joseph M.	A61C7/08	433/6
*	C	US-20060078688-A1	04-2006	DeSimone; Joseph M.	A61C7/08	264/494
*	D	US-7641828-B2	01-2010	DeSimone; Joseph M.	A61C7/08	264/16
*	E	US-20220249203-A1	08-2022	LI; Chunhua	B32B25/20	1/1
*	F	US-11213369-B2	01-2022	LI; Chunhua	B32B27/34	1/1
*	G	US-20210078357-A1	03-2021	VENKATASANTHANAM; Sriram	A61C13/0006	1/1
*	H	US-11109946-B2	09-2021	Venkatasanthanam; Sriram	A61C7/08	1/1
*	I	US-4253828-A	03-1981	Coles; Donna C.	A61C7/00	433/6
*	J	US-20150374464-A1	12-2015	STEWART; Ray F.	C09K11/06	264/16
*	K	US-20090298006-A1	12-2009	Schwartz; Dann	A61C7/08	433/34
*	L	US-20220287803-A1	09-2022	LI; Chunhua	B32B27/36	1/1
*	M	US-20220338957-A1	10-2022	LI; Chunhua	B32B27/365	1/1

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20221119

<i>Search Notes</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

CPC - Searched*		
Symbol	Date	Examiner
(see PE2E text search history printout)	11/18/2022	/vc/

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor / assignee / applicant search (PE2E)	11/18/2022	/vc/
PE2E text search history printout	11/18/2022	/vc/
related applications - 13/470,681; 15/476,655; 16/835,101; 17/553,590; 17/858,825	11/18/2022	/vc/

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	
--	--

<i>Index of Claims</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant					☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		DATE								
Final	Original	11/19/2022								
	1	-								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
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	27	✓								
	28	✓								
	29	✓								
	30	✓								



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 3552

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
17/902,445	09/02/2022	428	1787	22773-826.311		
RULE						
APPLICANTS ALIGN TECHNOLOGY, INC., San Jose, CA;						
INVENTORS Chunhua LI, Cupertino, CA; Yan CHEN, Cupertino, CA; Heinz PUDLEINER, Krefeld, GERMANY; Klaus MEYER, Dormagen, GERMANY; Joerg NICKEL, Dormagen, GERMANY; Craig PEHLERT, Lenox, MA;						
** CONTINUING DATA ***** This application is a CON of 17/858,825 07/06/2022 which is a CON of 17/553,590 12/16/2021 which is a CON of 16/835,101 03/30/2020 PAT 11213369 which is a CON of 15/476,655 03/31/2017 PAT 10973613 which is a DIV of 13/470,681 05/14/2012 PAT 9655691						
** FOREIGN APPLICATIONS *****						
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 09/20/2022						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/VIVIAN CHEN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 8	TOTAL CLAIMS 30	INDEPENDENT CLAIMS 4
ADDRESS Align Technology, Inc. / WSGR 650 Page Mill Road Palo Alto, CA 94304 UNITED STATES						
TITLE MULTILAYER POLYMER SHEETS						
FILING FEE RECEIVED 3300	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:				☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit	

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L500	3935	((Chunhua near1 li) or (yan near1 chen) or (Heinz near1 pudleiner) or (klaus near1 meyer) or (joerg near1 nickel) or (craig near1 pehlert)).in,aanm. or (align).as,aanm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:04 PM
L501	1367	(soft or ((polyurethane or urethane) near2 (elastomer\$3 or rubber\$2))) with (flexural near1 modulus)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:04 PM
L502	166	(soft or ((polyurethane or urethane) near2 (elastomer\$3 or rubber\$2))) with (ultimate near2 tensile near2 strength)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:04 PM
L503	791	(soft or ((polyurethane or urethane) near2 (elastomer\$3 or rubber\$2))) with (elongation near2 break)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:05 PM
L504	36527	(soft or ((polyurethane or urethane) near2 (elastomer\$3 or rubber\$2))) with (hardness or shore)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:05 PM
L505	26481	(orthodontic or dental) with (appliance or splint or brace or tray or plate)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:05 PM
L506	17397	(orthodontic or dental) near2 (appliance or splint or brace or tray or plate)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:05 PM
L507	1523	500 AND 506	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:06 PM
L508	18	507 AND 501 AND 502 AND 503 AND 504	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:07 PM
L509	18	505 AND 501 AND 502 AND 503 AND 504	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:16 PM
L510	18	501 AND 502 AND 503 AND 504	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:17 PM
L511	58284	(B32B27/36 or B32B27/08 or B32B27/34 or	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:17 PM

		B32B27/40 or A61C7/08 or B32B27/285 or B32B27/32 or B32B25/20 or B32B2375/00 or B32B2555/00 or B32B2323/04 or B32B2371/00 or B32B2323/10 or B32B2377/00 or B32B2367/00).cpc. or (a61c7/08 or a61c19/06 or a61f5/56 or a63b71/085).cpc.					
L512	18	511 AND 501 AND 502 AND 503	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:18 PM
L513	34780	(flexural near1 modulus)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:18 PM
L514	48933	((ultimate OR break OR breaking) near5 (tensile near2 strength))	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:19 PM
L515	61711	(elongation near2 (break OR breaking))	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:20 PM
L516	649916	(hardness OR shore OR durometer)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:20 PM
L517	2772	((polyurethane OR urethane) near2 (elastomer\$3 OR rubber\$2)).ab.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:21 PM
L518	31	517 AND 516 AND 515 AND 514 AND 513	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:21 PM
L519	31	518 NOT 500	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:22 PM
L520	0	518 AND 506	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:22 PM
L521	7	518 AND medical	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 06:22 PM
L522	130076	(flexural near1 modulus)	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/18 06:26 PM
L523	228741	((ultimate OR break OR breaking) near5 (tensile	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH,	OR	ON	ON	2022/11/18 06:27 PM

		near2 strength))	CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT)				
L524	404372	(elongation near2 (break OR breaking))	(FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/18 06:27 PM
L525	3889075	(hardness OR shore OR durometer)	(FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/18 06:27 PM
L526	963	((polyurethane OR urethane) WITH (elastomer\$3 OR rubber\$2)) AND 522 AND 523 AND 524 AND 525	(FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/18 06:28 PM
L527	138410	(orthodontic OR dental) near2 (appliance OR splint OR brace OR tray	(FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD,	OR	ON	ON	2022/11/18 06:29 PM

		OR plate OR retainer)	DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT)				
L528	44	526 AND 527	(FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/18 06:29 PM
L529	17997	(orthodontic OR dental) near2 (appliance OR splint OR brace OR tray OR plate OR retainer)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 07:21 PM
L530	16	510 AND (elastic ADJ modulus)	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 07:48 PM
L531	9	510 AND (elastic ADJ modulus).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 07:48 PM
L532	1	"20220324211"	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/19 10:08 PM
L533	26	500 AND (flexural ADJ modulus).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/19 10:12 PM
L534	22	500 AND (flexural ADJ modulus).clm. AND (polyurethane OR urethane).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/19 10:13 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/902,445	09/02/2022	Chunhua LI	22773-826.311

CONFIRMATION NO. 3552

107046

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

PUBLICATION NOTICE



OC000000137108598

Title:MULTILAYER POLYMER SHEETS

Publication No.US-2022-0409344-A1

Publication Date:12/29/2022

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

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Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 17/902,445		Filing Date 09/02/2022		☐ To be Mailed		
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO										
APPLICATION AS FILED - PART I										
		(Column 1)	(Column 2)							
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)				
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A						
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A	N/A						
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A						
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *		x \$100 =						
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *		x \$480 =						
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL						
APPLICATION AS AMENDED - PART II										
AMENDMENT	02/06/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	* 26	Minus	** 30	= 0	x \$100 =		0		
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0	x \$480 =		0		
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		0		
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =				
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =				
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE				
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE				
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/BRENDA MURPHY/				
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".										
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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I hereby certify that this correspondence is being filed via
EFS-Web with the United States Patent and Trademark Office

Attorney Docket No.: 22773-826.311
Client Ref. No.: 1228.US.D1.C1.C1.C1.C1

on February 6, 2023

WILSON SONSINI GOODRICH & ROSATI

By: /Selen Whitaker-Paquet /

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Chunhua Li et al.

Application No.: 17/902,445

Filed: September 2, 2022

For: MULTILAYER POLYMER SHEETS

Customer No.: 107046

Confirmation No.: 3552

Examiner: Vivian CHEN

Art Unit: 1787

RESPONSE TO NON-FINAL OFFICE ACTION

MAIL STOP: AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

In response to the Non-final Office Action mailed November 25, 2022, please enter the following remarks. This response is being submitted prior to the three-month response ending on February 25, 2023. Accordingly, this response is timely filed.

Amendments to the Claims begin on **page 2** of this paper.

Remarks begin on **page 7**.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A multilayer sheet comprising:
a first layer ~~comprising~~ containing a single polymer, wherein the single polymer of the first layer is a co-polyester, and wherein the first layer has ~~having~~ a flexural modulus greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, a tensile strength at yield of 4000-6500 psi, and an elongation at break of greater than 70%; and
a second layer ~~comprising~~ containing a single polymer, wherein the single polymer of the second layer is a thermoplastic polyurethane elastomer, and wherein the second layer has ~~having a~~ flexural modulus greater than 35,000 psi, an ultimate tensile strength of greater than 5000 psi[[:]], an elongation at break of greater than 200%, and a hardness of 60A to 85D; and
a third layer;
wherein the ~~co-polyester first layer~~ first layer has an elastic modulus greater than the second layer ~~thermoplastic polyurethane elastomer~~; and
wherein the multilayer sheet is incorporated into an orthodontic appliance.
2. (Currently Amended) The multilayer sheet of claim 1, wherein the third layer contains a single polymer, and wherein the single polymer of the third layer is a same or different co-polyester as the single polymer of the first layer ~~comprises a same or different co-polyester~~; and wherein the first layer is disposed between the second layer and the third layer.
3. (Currently Amended) The multilayer sheet of claim 1, comprising a fourth layer containing a single polymer, wherein the single polymer of the fourth layer is a same or different thermoplastic polyurethane elastomer as the single polymer of the second layer ~~comprising a same or different thermoplastic polyurethane elastomer~~; and wherein the first layer and the third layer are disposed between the fourth layer and the second layer.
4. (Original) The multilayer sheet of claim 1, wherein the first layer has a light transmission between 400 nm and 800 nm of greater than about 75%.
5. (Original) The multilayer sheet of claim 1, wherein the first layer is coextruded with or laminated to the third layer.

6. (Currently Amended) A multilayer dental aligner for repositioning a patient's teeth from a first arrangement toward a second arrangement, the multilayer dental aligner comprising:

a multilayer sheet comprising:

a first layer ~~comprising~~ containing a single polymer, wherein the single polymer of the first layer is a co-polyester, and wherein the first layer has having a flexural modulus greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, a tensile strength at yield of 4000-6500 psi, and an elongation at break of greater than 70%; and

a second layer ~~comprising~~ containing a single polymer, wherein the single polymer of the second layer is a thermoplastic polyurethane elastomer, and wherein the second layer has having a flexural modulus greater than 35,000 psi, an ultimate tensile strength of greater than 5000 psi[[;]], an elongation at break of greater than 200%, and a hardness of 60A to 85D; and

wherein the multilayer sheet forms a plurality of tooth-receiving cavities configured to receive and reposition the patient's teeth from the first arrangement toward the second arrangement.

7. (Currently Amended) The multilayer dental aligner of claim 6, wherein the multilayer sheet further comprises a third layer containing a single polymer, and wherein the single polymer of the third layer is ~~comprising~~ a same or different co-polyester as the single polymer of the first layer or a same or different thermoplastic polyurethane elastomer as the single polymer of the second layer.

8. (Currently Amended) The multilayer dental aligner of claim 6,

wherein the multilayer sheet further comprises a third layer containing a single polymer, wherein the single polymer of the third layer is ~~comprising~~ a same or different co-polyester as the single polymer of the first layer;

wherein the multilayer sheet further comprises a fourth layer containing a single polymer, wherein the single polymer of the fourth layer is ~~comprising~~ a same or different thermoplastic polyurethane elastomer as the single polymer of the second layer, and

wherein the third layer and the first layer are disposed between the second layer and the fourth layer.

9. (Currently Amended) The multilayer dental aligner of claim 6, wherein the first layer ~~co-~~ polyester has an elastic modulus greater than the second layer thermoplastic polyurethane elastomer.

10. (Currently Amended) A multilayer dental aligner for repositioning a patient's teeth from a first arrangement toward a second arrangement, the multilayer dental aligner comprising:

a multilayer sheet comprising:

a first layer ~~comprising~~ consisting of a co-polyester, the co-polyester having a flexural modulus of greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, a tensile strength at yield of 4000-6500 psi, and an elongation at break of greater than 70%;

a second layer ~~comprising~~ consisting of a thermoplastic polyurethane elastomer, the thermoplastic polyurethane elastomer having an ultimate tensile strength of greater than 5000 psi, an elongation at break of greater than 200%, and a hardness of 60A to 85D;

a third layer; and

wherein the multilayer sheet forms a plurality of tooth-receiving cavities configured to receive and reposition the patient's teeth from the first arrangement toward the second arrangement.

11-12 (Canceled)

13. (Currently Amended) The multilayer dental aligner of claim 10, wherein the third layer consists of ~~comprises~~ a same or different co-polyester or a same or different thermoplastic polyurethane elastomer.

14. (Original) The multilayer dental aligner of claim 13, wherein the first layer is disposed adjacent to the third layer.

15. (Original) The multilayer dental aligner of claim 13, wherein the first layer is co-extruded with or laminated to the third layer.

16. (Original) The multilayer dental aligner of claim 10, wherein the multilayer sheet further comprises a fourth layer and wherein the first layer and the third layer are disposed between the second layer and the fourth layer.

17. (Currently Amended) The multilayer dental aligner of claim 16, wherein the fourth layer consists of ~~comprises~~ a same or different thermoplastic polyurethane elastomer.

18. (Original) The multilayer dental aligner of claim 10, wherein the first layer is disposed between the second layer and the third layer.
19. (Original) The multilayer dental aligner of claim 10, wherein the co-polyester has an elastic modulus greater than the thermoplastic polyurethane elastomer.
20. (Currently Amended) A multilayer dental aligner for repositioning a patient's teeth from a first arrangement toward a second arrangement, the multilayer dental aligner comprising:
a multilayer sheet comprising:
a first layer ~~comprising~~ consisting of a co-polyester, the co-polyester having an elongation at break of greater than 70%, a flexural modulus of greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, and a tensile strength at yield of 4000-6500 psi; and
a second layer comprising a thermoplastic polyurethane elastomer having an elongation at break of greater than 200%, an ultimate tensile strength of greater than 5000 psi, and a hardness of 60A to 85D; and
wherein the multilayer sheet forms a plurality of tooth-receiving cavities configured to receive and reposition the patient's teeth from the first arrangement toward the second arrangement.
21. (Original) The multilayer dental aligner of claim 20, wherein the multilayer sheet further comprises a third layer.
22. (Currently Amended) The multilayer dental aligner of claim 21, wherein the third layer consists of ~~comprises~~ a same or different thermoplastic polyurethane elastomer.
23. (Currently Amended) The multilayer dental aligner of claim 21, wherein third layer consists of ~~comprises~~ a same or different co-polyester, and wherein the third layer is co-extruded with or laminated to the first layer.
24. (Original) The multilayer dental aligner of claim 21, wherein the third layer is disposed adjacent the first layer.
25. (Original) The multilayer dental aligner of claim 20, wherein the thermoplastic polyurethane elastomer of the second layer has a compression set of greater than 40% after 24 hours at 70° C.

- 26. (Canceled)
- 27. (Original) The multilayer dental aligner of claim 26, wherein the thermoplastic polyurethane elastomer of the second layer has a flexural modulus greater than 35,000 psi.
- 28. (Canceled)
- 29. (Original) The multilayer dental aligner of claim 20, wherein the first layer has a light transmission between 400 nm and 800 nm of greater than about 75%.
- 30. (Original) The multilayer dental aligner of claim 20, wherein the co-polyester has an elastic modulus greater than the thermoplastic polyurethane elastomer.

REMARKS

Upon entry of the instant amendments, claims 1-10, 13-25, 27, and 29-30 will be pending. Claims 11-12, 26, and 28 are herein canceled. Applicant reserves the right to pursue any canceled subject matter in a separate, related application. Claims 1-3, 6-10, 13, 17, 20, and 22-23 have been herein amended. Support for the amendments can be found throughout the application as filed. No new matter is introduced. Reconsideration in view of the remarks herein is respectfully requested.

Priority to Parent Applications

The Office Action alleged a lack of compliance with conditions under 35 U.S.C. § 120 for receiving the benefit of an earlier filing date, including to parent applications 13/470,681 (filed 05/14/2012), 15/476,655 (filed 03/31/2017), and 16/835,101 (filed 03/30/2020). Applicant respectfully disagrees. Nonetheless, solely in the interest of expediting allowance, the pending claims have been herein amended. By way of example, independent claim 1 as amended recites in part “a first layer containing a single polymer, wherein the single polymer of the first layer is a co-polyester, and wherein the first layer has” certain properties. Independent claim 6 as amended recites similar subject matter. Independent claim 10 as amended recites in part “a first layer consisting of a co-polyester, the co-polyester” having certain properties. Independent claim 20 as amended recites similar subject matter.

In view of the present amendments, Applicant respectfully submits that the claimed subject matter is entitled to the benefit of the earlier filing dates of the parent applications, including to May 14, 2012. *See* Office Action, 3-4. Accordingly, withdrawal of the remarks against the claimed priority is respectfully requested.

35 USC § 112

Claims 1-30 were rejected under 35 U.S.C. § 112 as allegedly indefinite. Applicant respectfully disagrees. Nonetheless, solely in the interest of expediting allowance, the pending claims have been herein amended. By way of example, independent claim 1 as amended recites in part “a first layer containing a single polymer, wherein the single polymer of the first layer is a co-polyester, and wherein the first layer has” certain properties. Independent claim 6 as amended recites similar subject matter. Independent claim 10 as amended recites in part “a first layer consisting of a co-polyester, the co-polyester” having certain properties. Independent claim 20 as amended recites similar subject matter. In view of the present amendments, Applicant respectfully submits that any

alleged indefiniteness has been addressed. Withdrawal of the rejections under 35 U.S.C. § 112 is respectfully requested.

Alleged Double Patenting

Claims 1-30 were rejected on the ground of nonstatutory double patenting as allegedly unpatentable over claims 1-31 of U.S. Patent No. 9,655,691; or claims 1-20 of U.S. Patent No. 9,655,693; or claims 1-27 of U.S. Patent No. 10,052,176; or claims 1-22 of U.S. Patent No. 10,973,613 in view of Tadros. Claims 1-30 were rejected on the ground of nonstatutory double patenting as allegedly unpatentable over claims 1-30 of U.S. Patent No. 11,154,384 in view of Tadros and Desimone. Claims 1-30 were also provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over the pending claims of co-pending Patent Publication No. 16/043,065 (U.S. 2019/0183611); or the pending claims of co-pending U.S. Application No. 16/264,420 (U.S. Patent Publication No. 2019/0159870); or the pending claims of co-pending U.S. Application No. 16/382,918 (U.S. Patent Publication No. 2019/0231484) in view of Tadros and Desimone. Claims 10-26 and 28-30 were also provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over the pending claims of co-pending U.S. Application No. 17/553,590 in view of Tadros and Desimone. Claims 1-30 were also provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-30 of co-pending U.S. Application No. 17/858,825 (U.S. Patent Publication No. 2022/0338957) in view of Tadros and Desimone.

Without conceding to the Office Action's characterizations of the various references above, Applicant respectfully submits that a Terminal Disclaimer is being submitted herewith. Accordingly, withdrawal of the double patenting rejections and a Notice of Allowance of claims 1-30 is respectfully requested.

35 USC § 103

Claims 10-26 and 28-30 were rejected under 35 U.S.C. § 103 as allegedly unpatentable over Tadros (U.S. Publication No. 2005/0100853), Desimone (U.S. Publication No. 2006/0078841), Kalili (2011/0020761), Texin 990R, and "Shore A Hardness Scale." Applicant respectfully disagrees. Nonetheless, solely in the interest of expediting allowance, the pending claims have been herein amended. For instance, independent claim 10 has been amended to recite in part "a first layer consisting of a co-polyester, the co-polyester having a flexural modulus of greater than 150,000 psi, an elongation at yield of greater than 4%, a tensile modulus greater than 150,000 psi, a tensile

strength at yield of 4000-6500 psi, and an elongation at break of greater than 70%” and “a second layer consisting of a thermoplastic polyurethane elastomer, the thermoplastic polyurethane elastomer having an ultimate tensile strength of greater than 5000 psi, an elongation at break of greater than 200%, and a hardness of 60A to 85D.” Independent claim 20 as amended recites similar subject matter. Applicant respectfully submits that the pending rejections fail to demonstrate that the cited references teach or suggest at least such features in combination. Accordingly, Applicant respectfully submits that pending claims 10, 13-25, 27, and 29-30 are patentably distinct over the cited references. Withdrawal of the corresponding rejections under 35 U.S.C. § 103 is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. Further, the Commissioner is hereby authorized to charge any additional fees or credit any overpayment in connection with this paper to Deposit Account No. 23-2415.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 206-573-2274.

Respectfully submitted,

Dated: February 6, 2023

/Yahn Lin CHU /

Yahn Lin CHU

Registration No. 75,946

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Fax 650-493-6811

TERMINAL DISCLAIMER TO OBTAIN A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION	Docket Number (Optional) 22773-826.311
In re Application of: Chunhua LI et al. Application No.: 17/902,445 Filed: September 2, 2022 For: MULTILAYER POLYMER SHEETS The applicant, <u>Align Technology, Inc.</u>, owner of <u>100</u> percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Nos. 16/043,065 filed July 28, 2018, 16/264,420 filed, January 31, 2019, 16/382,918 filed April 12, 2019 17/553,590 filed December 16, 2021 and 17/858,825 filed, July 6, 2022, as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the applicant does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that: any such patent granted on the pending reference application expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer filed prior to its grant. Check either box 1 or 2 below, if appropriate 1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee. I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. 2. ☒ The undersigned is an attorney or agent of record. Reg. No. <u>75,946</u> <u>/Yahn Lin CHU/</u> Signature <u>February 6, 2023</u> Date <u>Yahn Lin CHU</u> Typed or printed name <u>Attorney of Record</u> Title <u>206-573-2274</u> Telephone Number ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.	

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**TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**

Docket Number (Optional)
22773-826.311

In re Application of: Chunhua LI et al.

Application No.: 17/902,445

Filed: September 2, 2022

For: MULTILAYER POLYMER SHEETS

The applicant, Align Technology, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** Nos. 9,655,691, 9,655,693, 10,052,176, 10,973,613, 11,154,384, as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 75,946

/Yahn Lin CHU/
Signature

February 6, 2023
Date

Yahn Lin CHU
Typed or printed name

Attorney of Record
Title

206-573-2274
Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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Electronic Patent Application Fee Transmittal				
Application Number:		17902445		
Filing Date:		02-Sep-2022		
Title of Invention:		MULTILAYER POLYMER SHEETS		
First Named Inventor/Applicant Name:		Chunhua LI		
Filer:		Yahn Lin Chu/Selena Whitaker-Paquet		
Attorney Docket Number:		22773-826.311		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
Total in USD (\$)				170

Electronic Acknowledgement Receipt	
EFS ID:	47489069
Application Number:	17902445
International Application Number:	
Confirmation Number:	3552
Title of Invention:	MULTILAYER POLYMER SHEETS
First Named Inventor/Applicant Name:	Chunhua LI
Customer Number:	107046
Filer:	Yahn Lin Chu/Selena Whitaker-Paquet
Filer Authorized By:	Yahn Lin Chu
Attorney Docket Number:	22773-826.311
Receipt Date:	06-FEB-2023
Filing Date:	02-SEP-2022
Time Stamp:	19:47:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$170
RAM confirmation Number	E202326J48172122
Deposit Account	232415
Authorized User	Selena Whitaker-Paquet
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	22773_826_311_exTRNSMTL.pdf	265813	no	1
			df4524b7b59c2298a08824d355b7977804fb7e1a		
Warnings:					
Information:					
2		22773_826_311_exResp_NFOA_dtd_11_25_2022.pdf	140190	yes	9
			1ec2a76bb72c8203d22610d076940809080ee0de		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment/Request for Reconsideration-After Non-Final Rejection		1	1	
	Claims		2	6	
	Applicant Arguments/Remarks Made in an Amendment		7	9	
Warnings:					
Information:					
3	Terminal Disclaimer Filed	22773_826_311_exTerminal_Disclaimer_Ref_Applns.pdf	1421178	no	1
			36738ffa09c7adc59752bfb854baea583111d0cf8		
Warnings:					
Information:					
4	Terminal Disclaimer Filed	22773_826_311_exTerminal_Disclaimer_Patent.pdf	244847	no	1
			59275e7459f0db8c02fde6d2dc520fce1e496444		
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	37867	no	2
			5d1a232ea4909fe8b00e0e70fa6e5cf4b0dc33f1		

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Doc Code: TRAN.LET

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PTO/SB/21 (07-09)

Approved for use through 05/31/2024. OMB 0651-0031

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TRANSMITTAL FORM (to be used for all correspondence after initial filing)	Application Number	17/902,445	
	Filing Date	September 2, 2022	
	First Named Inventor	Chunhua LI et al.	
	Art Unit	1787	
	Examiner Name	Vivian CHEN	
Total Number of Pages in This Submission	12	Attorney Docket Number	22773-826.311

ENCLOSURES (Check all that apply)		
☐ Fee Transmittal Form ☒ Fee Attached ☒ Amendment/Reply ☐ After Final ☐ Affidavits/declaration(s) ☐ Extension of Time Request ☐ Express Abandonment Request ☐ Information Disclosure Statement ☐ Certified Copy of Priority Document(s) ☐ Reply to Missing Parts/ Incomplete Application ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53	☐ Drawing(s) ☐ Licensing-related Papers ☐ Petition ☐ Petition to Convert to a Provisional Application ☐ Power of Attorney, Revocation Change of Correspondence Address ☒ Terminal Disclaimer ☐ Request for Refund ☐ CD, Number of CD(s) _____ ☐ Landscape Table on CD	☐ After Allowance Communication to TC ☐ Appeal Communication to Board of Appeals and Interferences ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) ☐ Proprietary Information ☐ Status Letter ☐ Other Enclosure(s) (please identify below):
Remarks		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	WILSON SONSINI GOODRICH & ROSATI		
Signature	/Yahn Lin CHU/		
Printed name	Yahn Lin CHU		
Date	February 6, 2023	Reg. No.	75,946

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552
107046	7590	02/07/2023	EXAMINER	
Align Technology, Inc. / WSGR			CHEN, VIVIAN	
650 Page Mill Road			ART UNIT	
Palo Alto, CA 94304			PAPER NUMBER	
			1787	
			NOTIFICATION DATE	
			DELIVERY MODE	
			02/07/2023	
			ELECTRONIC	

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Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

<i>Applicant-Initiated Interview Summary</i>	Application No. 17/902,445	Applicant(s) LI et al.		
	Examiner VIVIAN CHEN	Art Unit 1787	AIA (First Inventor to File) Status Yes	Page 1 of 2

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
VIVIAN CHEN	Primary Examiner	Telephonic
Mr. Franklin Chuu	Attorney	

Date of Interview: 01 February 2023

Issues Discussed:

Other

Mr. Chuu discussed possible Claim Amendments to address outstanding rejections under 35 USC 103 in the previous Office Action mailed 11/25/2022 -- e.g., including additional required physical properties in the independent claims.

The Examiner indicated that such additional claim limitations (depending on the number and the types of additional physical properties required) MAY be sufficient to overcome the outstanding 103 rejections in the previous Office Action mailed 11/25/2022.

However, The Examiner suggested that in view of the Track 1 status of the present application, Applicant should consider focusing on achieving allowability for claims 1-9 (which are not presently subject to any rejections under 35 USC 103) and cancelling claims 10-30 (which Applicant might pursue at a later date in a continuation application).

As stated in the previous Office Action mailed 11/25/2022, the Examiner indicated that the present application has issues regarding:

- (i) the effective priority date of claims 1-30; and
- (ii) rejections under 35 USC 112(a) and/or USC 112(b);

because due to:

- (a) the lack of clarity as to whether the layer has the recited physical properties or whether the polymer itself has the recited physical properties; and
- (b) the lack of adequate support in the parent applications for requiring the polymer itself to have said physical properties.

In order to address the above issues, the Examiner refers Applicant to copending related Application No. 17/858,825, in particular the Interview held on 01/19/23 regarding a detailed discussion of substantially similar issues and the Examiner's suggestions regarding possible solutions.

No definite agreement on patentability was reached.

ATTACHMENT: 17858825-Examiner-Interview-Summary-Record-PTOL413-2023-JAN-19.pdf

<i>Applicant-Initiated Interview Summary</i>	Application No. 17/902,445	Applicant(s) LI et al.		
	Examiner VIVIAN CHEN	Art Unit 1787	AIA (First Inventor to File) Status Yes	Page 2 of 2

☒ Attachment

/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/858,825	07/06/2022	Chunhua LI	22773-826.310	1348
107046	7590	02/02/2023		
Align Technology, Inc. / WSGR 650 Page Mill Road Palo Alto, CA 94304			EXAMINER CHEN, VIVIAN	
			ART UNIT	PAPER NUMBER
			1787	
			NOTIFICATION DATE	DELIVERY MODE
			02/02/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

<i>Applicant-Initiated Interview Summary</i>	Application No. 17/858,825	Applicant(s) LI et al.		
	Examiner VIVIAN CHEN	Art Unit 1787	AIA (First Inventor to File) Status Yes	Page 1 of 2

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
VIVIAN CHEN	Primary Examiner	Telephonic
Mr. Franklin Chu	Attorney	
Ms. Esther Kepplinger	Attorney	

Date of Interview: 19 January 2023

Issues Discussed:

Other

Mr. Chuu discussed the proposed Claim Amendments emailed 01/09/2023 with respect to: (i) the outstanding rejections under 35 USC 112(a); and (ii) the issue of effective priority dates for the claims.

The Examiner indicate that the proposed Claim Amendments emailed 01/09/2023 would NOT fully address (i) and (ii) above, since the proposed language "layer HAS a single polymer" still allows for the presence of other materials which allows the physical properties of the "single polymer" to be different from the physical properties of the layer AS A WHOLE.

The Examiner suggested 2 possible claim amendments which would probably simultaneously resolve both (i) and (ii) above:

(1) claim language such as "...layer CONSISTING of a single polymer, wherein the POLYMER has [specific physical properties]..."

(2) claim language such as "...layer contains a SINGLE POLYMER, wherein the LAYER has [specific physical properties]..."

Option (2) is the most clearly supported by the disclosure as originally filed and preferred by the Examiner.

Option (1) is only implicitly supported by the disclosure as originally filed since for a layer CONSISTING of a single material, the physical properties of the layer and the material necessarily would be effectively the same. The Examiner further noted that the use of "consisting" language makes option (1) substantially more restrictive than option (2), which allows for the presence of other non-polymeric materials (e.g., conventional additives, etc.).

No definite agreement on patentability was reached.

ATTACHMENT: 17858825-Interview-Agenda-09-JAN-2023-email.pdf

☒ Attachment

<i>Applicant-Initiated Interview Summary</i>	Application No. 17/858,825	Applicant(s) LI et al.		
	Examiner VIVIAN CHEN	Art Unit 1787	AIA (First Inventor to File) Status Yes	Page 2 of 2

/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.



United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

User :Felicia Roberts

Sale Accounting Date:02/07/2023

Sale Item Reference Number
17902445

Effective Date
02/06/2023

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I202327046320728	1814	STATUTORY OR TERMINAL DISCLAIMER	\$170.00	Deposit Account

Application Number * 17/902,445 *	Application/Control No. 17/902,445	Applicant(s)/Patent under Reexamination LI et al.	
	Examiner CHEN, VIVIAN	Art Unit 1787	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed: <u>06 February 2023</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/FELICIA D ROBERTS/ Technology Center: <u>OPLC</u> Telephone: <u>(571)272-0550</u> <u>2 TDs approved with this filing date</u>



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NOTICE OF ALLOWANCE AND FEE(S) DUE

107046 7590 02/17/2023
Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER

CHEN, VIVIAN

ART UNIT PAPER NUMBER

1787

DATE MAILED: 02/17/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552

TITLE OF INVENTION: MULTILAYER POLYMER SHEETS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	05/17/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

107046 7590 02/17/2023

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552

TITLE OF INVENTION: MULTILAYER POLYMER SHEETS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	05/17/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHEN, VIVIAN	1787	428-332000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. **NOTE:** If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552
107046	7590	02/17/2023	EXAMINER	
Align Technology, Inc. / WSGR			CHEN, VIVIAN	
650 Page Mill Road			ART UNIT	
Palo Alto, CA 94304			PAPER NUMBER	
			1787	
DATE MAILED: 02/17/2023				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/902,445	Applicant(s) Li et al.	
	Examiner VIVIAN CHEN	Art Unit 1787	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Amendment and RCE and Terminal Disclaimer filed 02/06/2023.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are See Continuation Sheet. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some* c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. ____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has **THREE MONTHS FROM THE "MAILING DATE"** of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in **ABANDONMENT** of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ **CORRECTED DRAWINGS** (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ **DEPOSIT OF and/or INFORMATION** about the deposit of **BIOLOGICAL MATERIAL** must be submitted. Note the attached Examiner's comment regarding **REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL**.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material ____. 4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. <u>20230210</u> .	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
---	---

/VIVIAN CHEN/
Primary Examiner, Art Unit 1787

Continuation of 3. The allowed claim(s) is/are: 1-10,13-25,27 and 29-30

EXAMINER'S AMENDMENT

Status of Claims

1. Claims 1-10, 13-25, 27, 29-30 is/are allowed.
2. Claims 11-12, 26, 28 is/are previously cancelled.

Priority

3. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, 365(c), or 386(c) is acknowledged.

In view of the Claim Amendments filed 02/06/2023, claims 1-7, 31-34 have an effective filing date of 05/14/2012.

Terminal Disclaimer

4. The terminal disclaimer filed on 02/06/2023 disclaiming the terminal portion of the statutory term which would extend beyond the expiration date of U.S. Patent Nos. 9,544,691 and 9,655,693 and 10,052,176 and 10,973,613 and 11,154,384 has been reviewed and is accepted. The terminal disclaimer has been recorded.

5. The terminal disclaimer filed on 02/06/2023 disclaiming the terminal portion of the statutory term which would extend beyond the expiration date of any patents granted on U.S. Applications Nos. 16/043,065 and 16/264,420 and 16/382,918 and 17,553,590 and 17/858,825 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Examiner's Amendment

6. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Franklin Chuu on 02/10/2023.

7. Reasons for Examiner's Amendment:

See attached Interview Summary Record.

8. The application has been amended as follows:

In claim 20,

line 8, after "a second layer", "comprising" has been changed to --consisting of--.

In claim 27,

line 1, "claim 26" has been changed to --claim 20--.

Reasons for Allowance

9. The following is an examiner's statement of reasons for allowance:

The prior art of record fails to disclose a multilayer sheet utilized in an orthodontic appliance, wherein the multilayer sheet comprises: (i) the recited first layer containing a single polymer which is a copolyester, with the first layer having the recited properties; (ii) the recited second layer containing a single polymer which is a thermoplastic polyurethane elastomer, with the second layer having the recited properties; and (iii) the recited third layer; wherein the first layer and second layer has the recited difference in elastic modulus (claim 1).

The prior art of record fails to disclose a dental aligner containing a multilayer sheet, wherein the multilayer sheet comprises: (i) the recited first layer containing a single polymer which is a copolyester, with the first layer having the recited properties; (ii) the recited second layer containing a single polymer which is a thermoplastic polyurethane elastomer, with the second layer having the recited properties; and (iii) the recited third layer (claim 6).

The prior art of record fails to disclose a dental aligner containing a multilayer sheet, wherein the multilayer sheet comprises: (i) the recited first layer consisting of a copolyester with the recited properties; (ii) the recited second layer consisting of a thermoplastic polyurethane elastomer with the recited properties; and (iii) the recited third layer (claim 10).

The prior art of record fails to disclose a dental aligner containing a multilayer sheet, wherein the multilayer sheet comprises: (i) the recited first layer consisting of a copolyester with the recited properties; (ii) the recited second layer consisting of a thermoplastic polyurethane elastomer with the recited properties (claim 20).

The nonstatutory double patenting rejections based on U.S. Patent Nos. 9,655,691 (LI ET AL) or 9,655,693 (LI ET AL) or 10,052,176 (LI ET AL) or 10,973,613 (LI ET AL) or 11,154,384 (LI ET AL) in the previous Office Action mailed 11/25/2022 have been withdrawn in view of the Terminal Disclaimers filed 02/06/2023.

The **provisional** nonstatutory double patenting rejections based on copending Application Nos. 16/043,065 (US 2019/0183611) (LI ET AL) or 16/264,420 (U.S. 2019/0159870) (LI ET AL) or 16/382,918 (US 2019/0231484) (LI ET AL) or 17/553,590 (LI ET AL) or 17/858,825 (LI ET AL) in the previous Office Action mailed 11/25/2023 have been withdrawn in view of the Terminal Disclaimers filed 02/06/2023.

TADROS ET AL (US 2005/0100853) discloses the use of layers containing polymeric blends, and therefore fails to specifically disclose or suggest a multilayer sheet containing: (i) at least one layer containing the specified copolyester as the only polymer combined with at least one layer containing the specified thermoplastic polyurethane elastomer as the only polymer; or (ii) at least one layer **consisting** of the specified copolyester combined with at least one layer **consisting** of the specified thermoplastic polyurethane elastomer.

DESIMONE ET AL (US 2006/0078841) and LI ET AL (US 2011/0039223) fail to specifically disclose or suggest a multilayer sheet containing: (i) at least one layer containing the specified thermoplastic polyurethane elastomer as the only polymer; or (ii) at least one layer **consisting** of the specified thermoplastic polyurethane elastomer.

KALILI (US 2011/0020761) and CN 108394152 fail to specifically disclose or suggest a multilayer sheet containing: (i) at least one layer containing the specified copolyester as the only polymer; or (ii) at least one layer **consisting** of the specified copolyester.

RIEDL ET AL (US 2012/035484) fails to disclose or suggest multilayer sheets containing: (i) at least one layer containing the specified copolyester as the only polymer; or (ii) at least one layer **consisting** of the specified copolyester; which are formed into an orthodontic or dental appliances.

WO 2010/043419 (HINZ-WO '419) and KALLILI (US 2011/0020761) and ADELL ET AL (US 7,201,575) and DESIMONE ET AL (US 2008/0248438) and WHEELER, deceased ET AL (US 5,335,675) and DE 102010036107 fail to specifically disclose or suggest: (i) multilayer sheets containing at least one layer containing the specified copolyester as the only polymer combined with at least one layer containing the specified thermoplastic polyurethane elastomer as the only polymer; or (ii) multilayer sheets containing at least one layer **consisting** of the specified copolyester and at least one layer **consisting** of the specified thermoplastic polyurethane elastomer.

CHIN ET AL (US 2004/0146670) and CN 103374211 and ABBATTE ET AL (US 4,755,139) and WILLISON ET AL (US 2007/0087300) and KRANENBURG-VAN DIJK ET AL (US 2002/0146549) and WOLFE, JR (4,843,124) and HAGMAN (US 4,739,012) and TAKAGI ET AL (US 6,746,757) fail to disclose multilayer sheets containing three layers or more which contain: (i) at least one layer containing the specified copolyester as the only polymer combined with at least one layer containing the specified thermoplastic polyurethane elastomer as the only polymer; or (ii) at least one layer **consisting** of the specified copolyester and at least one layer **consisting** of the specified thermoplastic polyurethane elastomer, and which are formed into an orthodontic or dental appliances.

MATSUMOTO ET AL (US 4,410,595) and WHEELER, deceased ET AL (US 5,335,675) fail to disclose multilayer sheets formed into orthodontic or dental appliances.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vivian Chen (Vivian.chen@uspto.gov) whose telephone number is (571) 272-1506. The examiner can normally be reached on Monday through Thursday from 8:30 AM to 6 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho, can be reached on (571) 272-1123. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

The General Information telephone number for Technology Center 1700 is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

February 11, 2023

/Vivian Chen/

Primary Examiner, Art Unit 1787

<i>Examiner-Initiated Interview Summary</i>	Application No. 17/902,445	Applicant(s) LI et al.		
	Examiner VIVIAN CHEN	Art Unit 1787	AIA (First Inventor to File) Status Yes	Page 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
VIVIAN CHEN	Primary Examiner	Telephonic
Mr. Franklin Chuu	Attorney	

Date of Interview: 10 February 2023

Issues Discussed:

Other

Mr. Chuu gave authorization for Examiner's Amendment in order to place the application in condition for allowance (e.g., in claim 20, for the second layer, "comprising" has been changed to "consisting of" to be consistent with claim 10 and Applicant's comments in the Reply filed 02/06/2023; the dependency of claim 27 has been corrected).

/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Notice of References Cited	Application/Control No. 17/902,445		Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN		Art Unit 1787	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20110039223-A1	02-2011	Li; Chunhua	B29C45/0001	264/16
*	B	US-20120315484-A1	12-2012	Riedl; Josef	B29C48/307	156/306.6
*	C	US-20110020761-A1	01-2011	Kalili; Thomas	A61C7/08	433/214
*	D	US-7201575-B2	04-2007	Adell; Loren S.	A61C13/0001	433/80
*	E	US-20080248438-A1	10-2008	DeSimone; Joseph M.	A61C7/08	433/6
*	F	US-5335675-A	08-1994	Wheeler, deceased; Robert G.	B29C49/00	128/842
*	G	US-20040146670-A1	07-2004	Chin, Albert	B29C48/13	428/35.2
*	H	US-4755139-A	07-1988	Abbatte; Gerard P.	A61C7/08	433/6
*	I	US-20070087300-A1	04-2007	Willison; Brian D.	A61C7/12	433/6
*	J	US-20020146549-A1	10-2002	Kranenburg-Van Dijk, Saskia I.	B32B27/06	428/480
*	K	US-4843124-A	06-1989	Wolfe, Jr.; James R.	C08L11/00	525/173
*	L	US-4739012-A	04-1988	Hagman; John F.	C08L27/06	525/166
*	M	US-6746757-B1	06-2004	Takagi; Kiyoji	B32B27/34	428/476.3

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
*	N	CN 108394152 A	08-2018	CN	WANG	
*	O	WO 2010/043419 A	04-2010	WO	HINZ et al	
*	P	DE 102010036107 A	03-2012	DE	SCHEU et al	
*	Q	CN 103374211 A	10-2013	CN	BAI et al	
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20230210

Notice of References Cited	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN	Art Unit 1787	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-4410595-A	10-1983	Matsumoto; Koichi	B32B27/34	428/424.4
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
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	P					
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	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20230210

Issue Classification 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN	Art Unit 1787	

CPC						
Symbol					Type	Version
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B32B	/	2367	/	00	A	2013-01-01
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B32B	/	2375	/	00	A	2013-01-01
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B32B	/	2307	/	40	A	2013-01-01

NONE		Total Claims Allowed:	
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/VIVIAN CHEN/ Primary Examiner, Art Unit 1787		O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN	Art Unit 1787	

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/VIVIAN CHEN/ Primary Examiner, Art Unit 1787 (Primary Examiner)		11 February 2023 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 1

<i>Issue Classification</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

CPC Combination Sets					
Symbol	Type	Set	Ranking	Version	

NONE	Total Claims Allowed:	
(Assistant Examiner)	(Date)	26
/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	11 February 2023	O.G. Print Claim(s)
(Primary Examiner)	(Date)	O.G. Print Figure
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Issue Classification 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.	
	Examiner VIVIAN CHEN	Art Unit 1787	

INTERNATIONAL CLASSIFICATION				
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B32B25/08	/	25	/	08
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A61C19/06	/	19	/	06
A61C7/00	/	7	/	00
A63B71/08	/	71	/	08
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NON-CLAIMED				
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US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 26	
/VIVIAN CHEN/ Primary Examiner, Art Unit 1787 (Primary Examiner) _____ (Date) 11 February 2023		O.G. Print Claim(s) 1	O.G. Print Figure 1

<i>Issue Classification</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE (Assistant Examiner) (Date)		Total Claims Allowed: 26	
/VIVIAN CHEN/ Primary Examiner, Art Unit 1787 (Primary Examiner) (Date)		11 February 2023 O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

☐ Claims renumbered in the same order as presented by applicant
 ☐ CPA
 ☒ T.D.
 ☐ R.1.47

CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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7	7	14	16	23	25										
8	8	15	17		26										
9	9	16	18	24	27										

NONE (Assistant Examiner) _____ (Date)		Total Claims Allowed: 26	
/VIVIAN CHEN/ Primary Examiner, Art Unit 1787 (Primary Examiner) _____ (Date)		11 February 2023 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 1

<i>Index of Claims</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant					☐ CPA		☒ T.D.		☐ R.1.47	
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<i>Search Notes</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

CPC - Searched*		
Symbol	Date	Examiner
(see PE2E text search history printout)	11/18/2022	/vc/
(see CPC search in PE2E text search history printout)	02/10/2023	/vc/

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor / assignee / applicant search (PE2E)	11/18/2022	/vc/
PE2E text search history printout	11/18/2022	/vc/
related applications - 13/470,681; 15/476,655; 16/835,101; 17/553,590; 17/858,825	11/18/2022	/vc/
inventor / assignee / applicant search (PE2E)	02/10/2023	/vc/
PE2E text search history printout	02/10/2023	/vc/

/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	
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<i>Search Notes</i> 	Application/Control No. 17/902,445	Applicant(s)/Patent Under Reexamination LI et al.
	Examiner VIVIAN CHEN	Art Unit 1787

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	(see Interference Search History in PE2E text search history printout)	02/10/2023	/vc/

/VIVIAN CHEN/ Primary Examiner, Art Unit 1787	
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CONFIRMATION NO. 3552

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
17/902,445	09/02/2022	428	1787	22773-826.311		
RULE						
APPLICANTS ALIGN TECHNOLOGY, INC., San Jose, CA;						
INVENTORS Chunhua LI, Cupertino, CA; Yan CHEN, Cupertino, CA; Heinz PUDLEINER, Krefeld, GERMANY; Klaus MEYER, Dormagen, GERMANY; Joerg NICKEL, Dormagen, GERMANY; Craig PEHLERT, Lenox, MA;						
** CONTINUING DATA ***** This application is a CON of 17/858,825 07/06/2022 which is a CON of 17/553,590 12/16/2021 which is a CON of 16/835,101 03/30/2020 PAT 11213369 which is a CON of 15/476,655 03/31/2017 PAT 10973613 which is a DIV of 13/470,681 05/14/2012 PAT 9655691						
** FOREIGN APPLICATIONS *****						
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 09/20/2022						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/VIVIAN CHEN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 8	TOTAL CLAIMS 30	INDEPENDENT CLAIMS 4
ADDRESS Align Technology, Inc. / WSGR 650 Page Mill Road Palo Alto, CA 94304 UNITED STATES						
TITLE MULTILAYER POLYMER SHEETS						
FILING FEE RECEIVED 0.00	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

BIB (Rev. 05/07).

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L529	1	("20220338957").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:42 PM
L530	106369	(A61C13/00 OR A61C19/06 OR A61C7/00 OR A61C7/08 OR A61F5/56 OR A63B71/085 OR B29C51/14 OR B29K2067/00 OR B29K2075/00 OR B29K2995/0026 OR B29K2995/007 OR B29K2995/0077 OR B29K2995/0082 OR Y10T428/31551 OR Y10T428/31565 OR Y10T428/31786 OR B32B2250/03 OR B32B2250/24 OR B32B2250/40 OR B32B2274/00 OR B32B2307/40 OR B32B2307/412 OR B32B2307/50 OR B32B2307/51 OR B32B2307/536 OR B32B2307/54 OR B32B2307/546 OR B32B2319/00 OR B32B2323/00 OR B32B2323/04 OR B32B2323/10 OR B32B2323/16 OR B32B2333/04 OR B32B2367/00 OR B32B2371/00 OR B32B2375/00 OR B32B2377/00 OR B32B2383/00 OR B32B25/08 OR B32B25/14 OR B32B25/20 OR B32B2535/00 OR B32B2555/00 OR B32B27/08 OR B32B27/281 OR B32B27/283 OR B32B27/285 OR B32B27/286 OR B32B27/30 OR B32B27/302 OR B32B27/308 OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:44 PM

L531	30473	B32B27/32 OR B32B27/34 OR B32B27/36 OR B32B27/365 OR B32B27/40 OR B32B7/022 OR B29L2031/753).cpc. ((Chunhua near1 li) OR (yan near1 chen) OR (Heinz near1 pudleiner) OR (klaus near1 meyer) OR (joerg near1 nickel) OR (craig near1 pehlert)).in,aanm. OR (align OR bayer).as,aanm.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:45 PM
L532	29852	(("CHEN; YAN".ine. OR "LI; CHUNHUA".ine. OR "MEYER; KLAUS".ine. OR "NICKEL; JOERG".ine. OR "PEHLERT; CRAIG".ine. OR "PUDLEINER; HEINZ".ine.)) OR (align OR bayer).as,aanm.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:45 PM
L533	1687	531 AND 530	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:46 PM
L538	18304	(orthodontic OR orthodontal OR dental) near2 (appliance OR splint OR brace OR tray OR plate OR retainer)	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:47 PM
L539	34410	flexural ADJ modulus	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:47 PM
L540	53	533 AND 538 AND 539	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:48 PM
L541	401	539 AND 538	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:49 PM
L542	4206	(elongation near2 yield\$3) AND (elongation near2 break\$4)	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:50 PM
L543	66	541 AND 542	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:50 PM
L544	297296	tensile ADJ strength	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:51 PM
L545	66	544 AND 543	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:51 PM
L546	5654	(orthodontic OR orthodontal OR dental) near2 (appliance OR splint OR brace OR tray	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:51 PM

L547	50	OR plate OR retainer).clm. 546 AND 545	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:51 PM
L548	1193	(elongation near2 yield\$3) AND (elongation near2 break\$4) AND (tensile ADJ modulus) AND (tensile ADJ strength)	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/10 05:53 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304



**Courtesy Reminder for
Application Serial No: 17/902,445**

Attorney Docket No: 22773-826.311

Customer Number: 107046

Date of Electronic Notification: 02/23/2023

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:
patentdocket@wsgr.com

To view your correspondence online or update your email addresses, please visit us anytime at <https://ppair-my.uspto.gov/pair/PrivatePair>.
If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

107046 7590 02/17/2023

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

James Brady	(Typed or printed name)
/James Brady/	(Signature)
April 5, 2023	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	09/02/2022	Chunhua LI	22773-826.311	3552

TITLE OF INVENTION: MULTILAYER POLYMER SHEETS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	05/17/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHEN, VIVIAN	1787	428-332000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 Wilson Sonsini Goodrich & Rosati

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Align Technology, Inc.

San Jose, CA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 23-2415

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Garrett T. Potter/

Date April 5, 2023

Typed or printed name Garrett T. Potter, Ph.D.

Registration No. 76,602

Electronic Patent Application Fee Transmittal				
Application Number:		17902445		
Filing Date:		02-Sep-2022		
Title of Invention:		MULTILAYER POLYMER SHEETS		
First Named Inventor/Applicant Name:		Chunhua LI		
Filer:		Garrett T Potter/James Brady		
Attorney Docket Number:		22773-826.311		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1200

Electronic Acknowledgement Receipt	
EFS ID:	47798544
Application Number:	17902445
International Application Number:	
Confirmation Number:	3552
Title of Invention:	MULTILAYER POLYMER SHEETS
First Named Inventor/Applicant Name:	Chunhua LI
Customer Number:	107046
Filer:	Garrett T Potter/James Brady
Filer Authorized By:	Garrett T Potter
Attorney Docket Number:	22773-826.311
Receipt Date:	05-APR-2023
Filing Date:	02-SEP-2022
Time Stamp:	17:25:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$1200
RAM confirmation Number	E202345H25266507
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	22773-826-311-issue-fee-transmittal-04-05-2023.pdf	113192	no	1
			7eadb9e22cc979d63d12fe2d009c5b55bf6429ec		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	37894	no	2
			475ab295fd4c3d32276dc3c2a113165fbd4eadd5		
Warnings:					
Information:					
Total Files Size (in bytes):			151086		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/902,445	05/16/2023	11648091	22773-826.311	3552

107046 7590 04/26/2023

Align Technology, Inc. / WSGR
650 Page Mill Road
Palo Alto, CA 94304

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at <https://patentcenter.uspto.gov/>. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at <https://certifiedcopycenter.uspto.gov/index.html>. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Chunhua LI, Cupertino, CA;
Yan CHEN, Cupertino, CA;
Heinz PUDLEINER, Krefeld, GERMANY;
Klaus MEYER, Dormagen, GERMANY;
Joerg NICKEL, Dormagen, GERMANY;

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

ALIGN TECHNOLOGY, INC., San Jose, CA;

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APPLICATION NO.	ISSUE DATE	PATENT NO.
17/902,445	16-MAY-23	11648091

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EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at <https://patentcenter.uspto.gov>

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit <https://www.uspto.gov/electronicgrants>