VT IMPRESIÓN 3D 1

PATENTES

Vigilancia Tecnológica

1er trimestre 2020

NIPO: 116-19-050-9

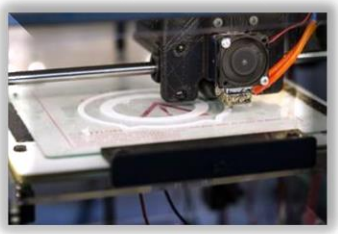
Aunque en los años 80 comenzaron a desarrollarse los primeros equipos y materiales sobre la tecnología de impresión 3D también denominada fabricación aditiva, no fue hasta 1986 cuando aparece en el mercado la primera impresora 3D comercial, patentada por Charles W. Hull, premiado por la Oficina Europea de Patentes como inventor del año en 2014 en la categoría de inventores no europeos. Cuando trataba de buscar un sistema para mejorar el proceso de realización de prototipos de pequeñas piezas de plástico que utilizaba para testar nuevos diseños de productos, desarrolló una máquina de impresión 3D que conseguía realizar en pocos minutos procesos que por aquel entonces llevaban semanas.

Desde entonces, la tecnología no ha parado de evolucionar, especialmente en los últimos años, alcanzándose a partir de 2017 un verdadero auge, cuando se incorpora la automatización utilizando software de inteligencia artificial que permite industrializar la fabricación aditiva y multiplicar la capacidad de los sistemas. En estos momentos, en que la pandemia del corona virus SARS-CoV-2 azota a la población mundial, la impresión 3D se ha puesto de gran actualidad. La necesidad de fabricar de forma urgente respiradores o material de protección personal ha despertado el interés por la utilización de esta tecnología, surgiendo así multitud de iniciativas públicas y privadas.

Contenido

PROCESOS

MATERIALES



DISPOSITIVOS

EQUIPOS AUXILIARES

PROCESAMIENTO DE DATOS

Desde la Oficina Española de Patentes y Marcas, y en cumplimiento de su doble objetivo de proteger y fomentar la innovación tecnológica en nuestro país, así como de divulgar la información técnica que contienen las patentes a través de sus servicios de Información Tecnológica, hemos realizado este nuevo Boletín de Vigilancia Tecnológica, que se suma a los dieciséis *Boletines VT* que venimos publicando desde el año 2000 con periodicidad trimestral. Nuestro objetivo es dar a conocer las nuevas solicitudes de patentes que se publican a nivel mundial relacionadas con la tecnología de impresión 3D.

En este primer número del Boletín, se incluye una selección de las solicitudes de patentes publicadas a nivel mundial durante el primer trimestre de 2020, distribuidas en cinco apartados: procesos, materiales, dispositivos, equipos auxiliares y procesamiento de datos.

Para cada patente se incluye su número de publicación, con un enlace que permite la consulta del documento completo, el solicitante, el país de origen y su título.

Como preámbulo de este primer número, también se presenta un breve análisis estadístico que, con una cobertura temporal más amplia que el boletín, recoge los datos de las solicitudes de patentes publicadas en el periodo 2010-2019, y que permite identificar la evolución temporal de la tecnología y los países de origen de la misma, así como los solicitantes más activos en el sector.

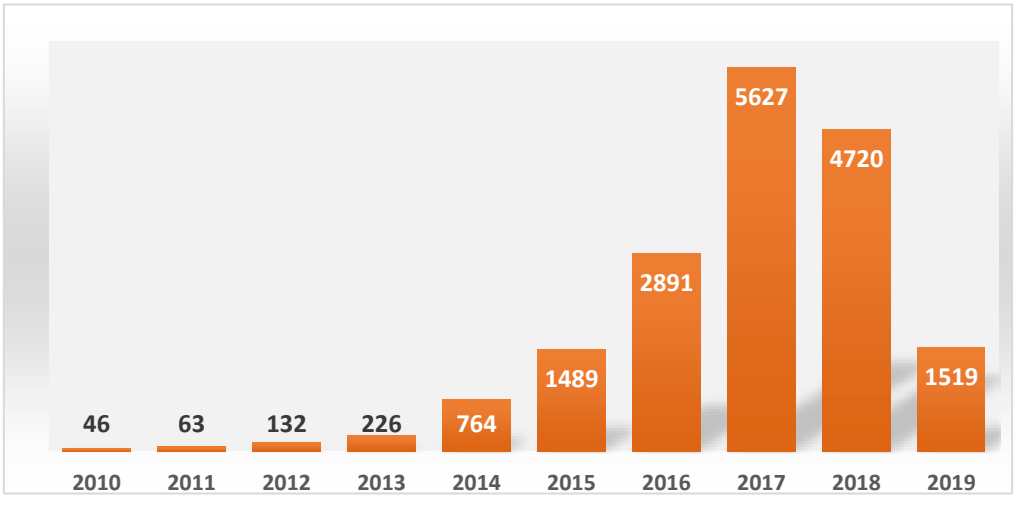
Esperamos que la información aportada en este Boletín de Vigilancia Tecnológica, sirva para identificar tendencias tecnológicas y sus actores, así como para contribuir a la utilización del conocimiento contenido en los documentos de patente como punto de partida para emprender nuevas actividades de investigación y desarrollo. Para suscribirse a este Boletín basta con cumplimentar este *formulario de suscripción.*

ANÁLISIS ESTADÍSTICO DE LAS SOLICITUDES DE PATENTE PUBLICADAS EN EL PERIODO 2010-2019

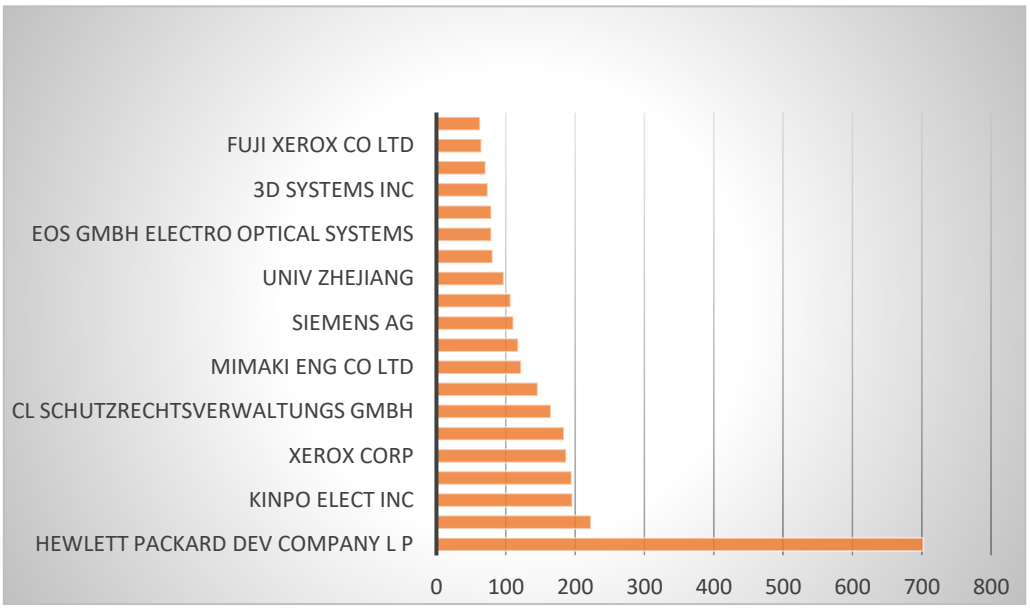
Se ha realizado un estudio estadístico con el fin de analizar la evolución de la tecnología de Impresión 3D, utilizando las patentes como indicador. Se han considerado las solicitudes de patentes publicadas en el periodo 2010-2019, para mostrar su evolución temporal, los solicitantes de patentes más activos, así como aquellos países donde se protege la tecnología en origen. La herramienta empleada ha sido *Global Patent Index (GPI)* de la Oficina Europea de Patentes.

Se han recuperado un total de 17.741 familias de patentes, que corresponden a 39.271 documentos de patentes. La primera gráfica muestra la evolución en el periodo 2010-2019. En ella se destaca el alto incremento de solicitudes que se viene produciendo a partir de 2017. Una de las razones de este aumento, podría atribuirse al desarrollo de tecnologías de inteligencia artificial que han facilitado, para la fabricación aditiva, el paso de una escala de prototipado a la producción en serie y a través de la nube. De esta manera, es el sistema quien decide dónde, cuándo y qué producto se imprime de la cola de impresión, según las prioridades establecidas por el cliente, como pueden ser la urgencia de entrega, los materiales, etc.

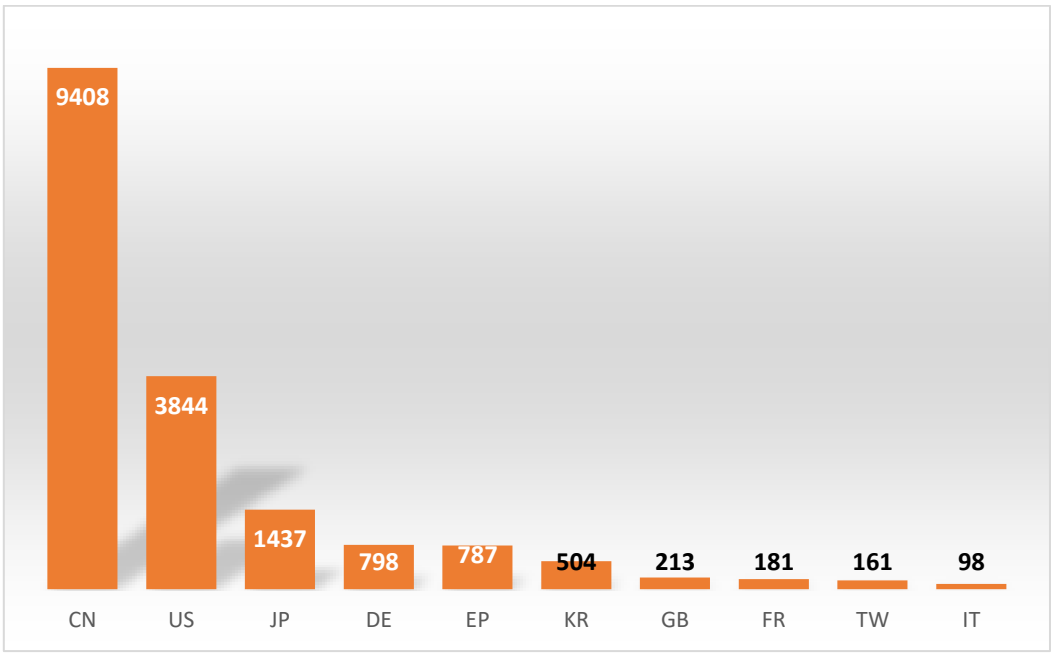
El aparente descenso en los dos últimos años, es debido a que, desde que se presentan las solicitudes de patente en las Oficinas de Patentes, hasta su publicación, ha de transcurrir un plazo de 18 meses, como aparece recogido en todas las legislaciones nacionales e internacionales. Es por ello por lo que no debe tenerse en consideración.



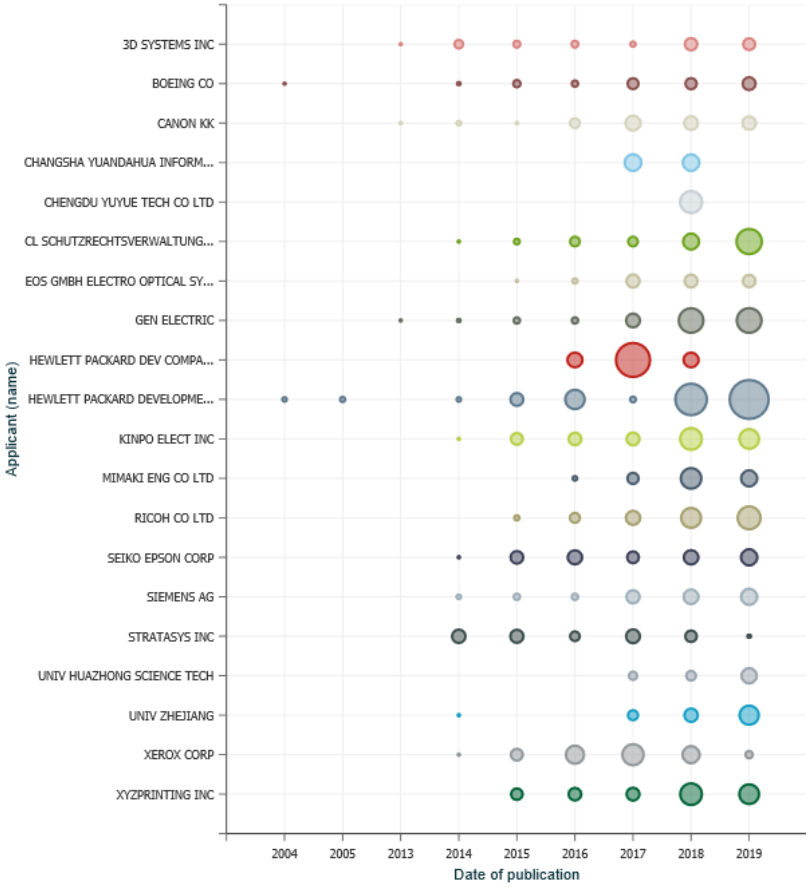
En la siguiente gráfica, se recogen los 10 solicitantes con mayor número de patentes protegidas en la tecnología de impresión 3D. Destaca la empresa americana HEWLETT PACKARD como líder indiscutible en el sector.



En la tercera gráfica mostrada se observan los países origen de la tecnología, donde se protegen las solicitudes prioritarias. China aparece en primer lugar, seguida de Estados Unidos con menos de la mitad de solicitudes prioritarias respecto a China.



La última gráfica ilustra la evolución temporal entre 2004 y 2019 de solicitudes de patentes publicadas sobre la tecnología de Impresión 3D por parte de los solicitantes más destacados. En líneas generales se observa una progresión ascendente en todos ellos.



Procesos

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
ES2745577	SERVICIO DE RADIOLOGÍA COMPUTERIZADA SL [ES]	Método para la fusión de imágenes de resonancia magnética y tomografía computerizada en un archivo imprimible en 3d para su uso en fabricación aditiva
EP3616886	BOEING CO [US]	Laser fabrication additive system and method
KR102076303	HAEUN CO LTD [KR]	Manufacturing Method of Decorative Stone Block
US2020047401	UNIV CARNEGIE MELLON [US]	Method and Device for Producing Vasculature through Extrusion-based 3D Printing
US2017136761	SIERADZKI PAUL [US] DOWNS DANIEL [US] R3 PRINTING INC [US]	System and method for on-demand colorization fo extrusion-based additive construction
US2020016825	NATIONAL CHUNG CHENG UNIV [TW]	Additive manufacturing method
CN110641012	(QING-N) QINGDAO WUWEI ZHIZAO TECHNOLOGY CO LTD [CN]	Preparation method, device and application of polymer full-degradation vascular stent microscale 3D printing
CN110641014	(SHEN-N) SHENZHEN JINGLAI NEW MATERIAL TECHNOLOGY [CN]	Method for constructing 3D micro / nano channel structure by using laser direct writing technology
US2020009795A1	DESKTOP METAL INC [US]	Interface layers and removable object supports for 3d printing
KR102063617	3DELIGHT [KR]	Color 3D Printing Method and Printer Thereof
WO2020009009	CANON KK [JP]	Modeling method and modeling device
US2018207865	CC3D LLC [US]	Additive manufacturing system
US2020001540	UNIV MINNESOTA [US]	Additive manufacturing on unconstrained freeform surfaces
DE102018115692	WZR CERAM SOLUTIONS GMBH [DE]	3D printing of organic fibers
US2019389124	ALLEVI INC [US]	Systems and methods for improved dispensing, layering, and deposition of cross-linkable hydrogels
US2019381725	UNIV CITY HONG KONG [HK]	Method and systems for four-dimensional printing of elastomer-derived ceramic structures by compressive buckling-induced method
US2019375009	DESKTOP METAL INC [US]	Method of forming multi-layer sintering object support structure
US2019375149	TEPHA INC [US]	Methods for 3Dprinting of poly-4-hydroxybutyrate and copolymers

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
US2019366639	PURDUE RESEARCH FOUNDATION [US]	Methods and apparatus for additive manufacturing utilizing multifunctional composite materials, and articles made therefrom
CN110524870	UNIV XI AN JIAOTONG	Internal flow model preparation
US2020074719	FUJI XEROX CO LTD [JP]	Three-dimensional object data generation apparatus, three-dimensional object forming apparatus, and non-transitory computer readable medium
US2019030805	XEROX CORP [US]	Method and system for alignment of a multi-nozzle extruder in three-dimensional object printers
US2020047400	CHEN IUN TAI ANNA [US] NEFEDOV SERGEY [RU]	3Dprinting at inclined angles
US2018272622	IBM [US]	Printing multicolored three-dimensional products
WO2020005717	INTREPID AUTOMATION [US]	Closed loop print process adjustment based on real time feedback
US2019366628	GUILLORY CLAY M [US] BOOTH NICHOLAS [US]	Liquid Cooling for Pellet Extruder in a Fused Deposition Modeling System
US2020061927	WALMART APOLLO LLC [US]	System and Methods for Using Three Dimensional Printing to Fabricate Contoured Dividers
CN110834410	UNIV SOUTHERN MEDICAL(UNSM) [CN]	Method for forming complex three-dimensional structure of PDMS based on 3D printing

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Materiales

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
ES1241929	CHACÓN ARRUE, MARIA (ES)	Material compuesto y su uso para fabricar objetos por impresión 3d
WO2020051039	DOW SILICONES CORP [US]	Low viscosity compositions and 3d printing methods utilizing the compositions
US2020061239	ORTHOPAEDIC INNOVATION CENTRE INC [CA]	Antimicrobial articles produced by additive manufacturing
EP3620283	RICOH CO LTD [JP]	Resin powder, method of and device for manufacturing a solid freeform object
EP3616914	3M INNOVATIVE PROPERTIES CO [US]	Mmatrix material-boron nitride composite for 3D printed component part
US2020071432	MATSUMURA TAKASHI [JP] NIIMI TATSUYA [JP] SAITO TAKUYA [JP]	Active energy ray curable liquid, resin and gel fabrication object
CN110755678	(UYMB) UNIV CHINA MINING & TECHNOLOGY BEIJING [CN]	3D printed antibacterial hydrogel wound dressing based on green in situ reduction
CN110724234	(BYDB) BYD CO LTD [CN]	Photosensitive resin composition for three-dimensional
JP2020019841	(RICO) RICOH KK [JP]	Composition, cured product, container, image forming apparatus, and method
US2020040306	LUNG BIOTECHNOLOGY PBC [US]	Material and method for producing cell receiving scaffold
WO2020023041	HEWLETT PACKARD DEVELOPMENT CO [US]	Three-dimensional printing
WO2020015905	ARKEMA FRANCE [FR]	Articles prepared using curable compositions based on polymerizable ionic species
EP3599259	SABIC GLOBAL TECHNOLOGIES BV [NL]	Polystyrene-based filament for support structure in fused filament fabrication
WO2020017122	G C DENTAL IND CORP [JP]	Composition for three-dimensional shaping and method for producing dental article
WO2020018104	HEWLETT PACKARD DEVELOPMENT CO [US]	Three-dimensional printing
KR20190134923	UNIV DANKOOK IACF [KR]	SLS 3D Organic inorganic hybrid composition for SLS 3D printing
WO2019230132	MAXELL HOLDINGS LTD [JP]	Photo-fabrication composition set
JP2020011450	(XERF) FUJI XEROX CO LTD	3D modeling material set and 3D modeling apparatus

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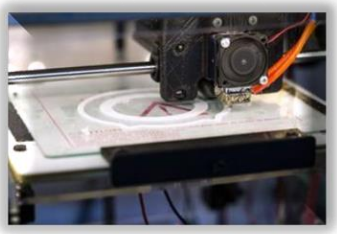
Dispositivos



Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
ES2738026	HERNANDEZ JUANPERA, JESUS (ES)	Bloque, panel y sistema para electrodeposición 3d
ES2739028	IKASIA TECHNOLOGIES S.L. (ES)	Máquina de impresión 3d y cocinado simultáneo de alimentos
KR102083788	T&R BIOFAB CO LTD [KR]	3D printing system for artificial blood vessel manufacturing
KR20200019293	KIM DONG OUN [KR]	3D pen with Joystick for 3D printing
JP2020029084	(XERF) FUJI XEROX CO LTD [JP]	Fiber reinforced resin manufacturing equipment and molding equipment
KR20200017570	DENTIS CO LTD [KR]	3D printer with interior assembly that display unit and control unit are integrated
RU2710821	FEDERALNOE GOSUDARSTVENNOE BYUDZHETNOE OBRAZOVATELNOE UCHREZHDENIE VYSSHEGO OBRAZOVANIYA MOSKOVSKIJ [RU]	Device for obtaining articles from high-temperature polymers by selective laser sintering
JP2020026062	(XERF) FUJI XEROX CO LTD [JP]	Modeling equipment
US2020055239	STRATASYS INC [US]	Laser preheating in three-dimensional printing
KR102078811	SFS CO LTD [KR]	3 Job box assembly and 3D printer including the same
US2020055242	KWAK JU HYUN [KR] DAPEX GLOBAL CO LTD [KR] JAEMYUNG IND CO LTD [KR]	Curing device
US2020055252	LEWICKI JAMES [US] COMPEL WILLIAM [US] TORTORELLI DANIEL [US] FERNANDEZ AYALA FELIPE [EC]	Optimal toolpath generation system and method for additively manufactured composite materials
WO2020032959	HEWLETT PACKARD DEVELOPMENT CO [US]	Three-dimensional (3d) printing using bounding
KR20200013272	INSTERN CO LTD [KR]	3D extrusion part replacement-type multi-color 3D printer
US10562226	SOUTHERN METHODIST UNIV [US]	Additive manufacturing of active devices using dielectric, conductive, and magnetic materials
US2020047249	SEIKO EPSON CORP [JP]	Metal shaped article production method
US2017106593	L LIVERMORE NAT SECURITY LLC [US]	Spatter reduction laser scanning strategy in selective laser melting

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
WO2020027805	HEWLETT PACKARD DEVELOPMENT CO [US]	Ultrasonic spreading blades with kickers
KR20200010648	BYUN JONG BUM [KR] TONGMYONG UNIV INDUSTRIAL ACADEMIC COOPERATION FOUNDATION [KR]	3D printer with detachable magnetic bed
KR20200010678	LEE KWANG MIN [KR]	3D printer forming a 3-dimensional object
US2020031052	NISHIO TAKUEI [JP] TAMURA ASATO [JP]	Three-dimensional object shaping apparatus and method
WO2020017405	NIKON CORP [JP]	Shaping system
US2020023573	AREVO INC [US]	Generating tool paths to preserve filament continuity in additive manufacturing
WO2020013748	P A M P NORDIC SYSTEMS AB [SE]	Head, deposition arrangement, and methods for controlling a head
WO2020012429	SISMA SPA [IT]	Modelling head for a three-dimensional printing machine and process for calibrating said modelling head
US2018304533	DESKTOP METAL INC [US]	System and method for moving build material using a gripper in a 3D printing system
EP3590631	RENISHAW PLC [GB]	Acoustic emission sensing in powder bed additive manufacturing
DE102018116314	AESCULAP AG [DE]	Construction platform for the generative manufacture of a component
WO2020006253	3D SYSTEMS INC [US]	Three-dimensional printing system with laser calibration system
JP2020001363	(RLND) ROLAND DG KK	3D modeling equipment
KR20190143523	HURO [KR]	Conical variable nozzle
KR20190143517	KOREA ELECTRONICS TECHNOLOGY [KR]	3D printing apparatus using capacitive droplet ejection type
WO2020002805	SAFRAN [FR]	Device and method for direct manufacturing by laser fusion of sprayed powder
KR102060799	3DELIGHT [KR]	Automatic heat addition agitation and supply resin Vat
WO2020002756	PLANMECA OY [FI]	Stereolithography apparatus equipped for detecting superfluous material on build platform, and method of operating the same
US2020009790	XYZPRINTING INC [TW] KINPO ELECT INC [TW]	Sealed type light curing 3D printer
KR102055434	3DTECHNOLOGY CO LTD [KR] PARK BYEONG WUN [KR]	3D printer nozzle system with increased cooling

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
WO2019236102	HEWLETT PACKARD DEVELOPMENT CO [US]	Build material distributing cylinders
JP2019209688	TOKYO METRO IND TECH RES INST	Laminate shaping apparatus, processing method for three-dimensional object, three-dimensional object and mold
KR20190136666	CANON KOREA BUSINESS SOLUTIONS INC [KR]	Automatic feeding apparatus for filament of three-dimensional printer
FR3082141	D & D [FR]	3D printing device for manufacturing parts i.e. dental models
KR20190134875	DOCTORPLANT CO LTD [KR]	LCD 3D Output enhancementing device and single beam LCD 3D printer equipped with it

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Equipos Auxiliares

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
ES1243310	GARCIA SERRANO, SIXTO	Dispositivo Para Empalmar Filamentos De Impresoras 3D
WO2020048798	EOS GMBH ELECTRO OPICAL SYSTEMS [DE]	Device And Method For The Additive Manufacturing Of A Three-Dimensional Object
KR20200010639	CHOI EUN JI [KR]	3D Uv Diy Kit Uv Led 3D Printing Fusion Resin Diy Kit And Exchangeable Uv Led Mini Curing Machine
WO2020046262	HEWLETT PACKARD DEVELOPMENT CO [US]	Modules Of Three-Dimensional (3D) Printers
WO2020046285	HEWLETT PACKARD DEVELOPMENT CO [US]	Virtualized Environment For Three-Dimensional Printing
WO2020046361	HEWLETT PACKARD DEVELOPMENT CO [US]	Separation Of Printed Objects
US2020070421	CARBON INC [US]	Robotic Additive Manufacturing System
WO2020040765	HEWLETT PACKARD DEVELOPMENT CO [US]	Anomolous Nozzle Determination Based On Thermal Characteristic
US2020061871	CINCINNATI INC [US]	Systems And Apparatus For Additive Manufacturing
US2020061919	CARBON INC [US]	Window Cassettes For Reduced Polymerization Inhibitor Irregularity During Additive Manufacturing
CN110802837	(KOCE-N) KOCEL INTELLIGENT EQUIP CO LTD	DM printing product support structure and printing method
KR20200017591	TRENDSEOUL LTD [KR]	Filament Selection And Supplying Device
WO2020035100	VOXELJET AG [DE]	Closure Device, 3D Printing Device And Method For Producing 3D Mouldings
US2020055249	MASSIVIT 3D PRINTING TECH LTD [IL]	Extrusion Orifice Cleaning
WO2020033124	VELO3D INC [US]	Aspects Of Three-Dimensional Object Formation
DE102018121915	DYEMANSION GMBH [DE]	Process for the surface treatment of molded parts
FR3084276	SAFRAN AIRCRAFT ENGINES [FR]	Power processing device for additive manufacture, additive manufacturing system, related methods
EP3608084	CONCEPT LASER GMBH [DE]	Separating Device
WO2020023039	HEWLETT PACKARD DEVELOPMENT CO [US]	Cleaning Mechanisms For Build Material Level Sensors
US2020031993	STRATASYS INC [US]	Water Dispersible Polymer For Use In Additive Manufacturing
WO2020023051	HEWLETT PACKARD DEVELOPMENT CO [US]	Build Module With Deformable Wall

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
US2020031042	GEN ELECTRIC [US]	Systems And Methods For Lateral Material Transfer In Additive Manufacturing System
US2020023569	VALORBEC SOC EN COMMANDITE [CA]	Method And System For 4D Printing Of Composites
KR20190143540	LEE HO HYUNG [KR]	3D Printer Pen Capable Of Measuring Distance
EP3597428	TECHNISCHE UNIV DRESDEN [DE]	Device For Additive Production Of Components In Which A Platform Can Be Inserted Into A Printing Tank Filled With A Photostructurable Liquid Polymer
EP3590631	RENISHAW PLC [GB]	Acoustic Emission Sensing In Powder Bed Additive Manufacturing
WO2020003312	STRATASYS LTD [IL]	Structure Supporting An Object During Additive Manufacturing And Method For Forming
WO2020005717	INTREPID AUTOMATION [US]	Closed Loop Print Process Adjustment Based On Real Time Feedback
FR3082775	S A S 3DCERAM SINTO [FR]	Process for cleaning ceramic raw parts obtained during the additive manufacturing
JP2020001368	MIMAKI ENG CO LTD	Adjustment method of modeling device
US2019389138	GEN ELECTRIC [US]	Additively Manufactured Build Assemblies Having Reduced Distortion And Residual Stress
US2019389139	3D SYSTEMS INC [US]	3D Printing Build Materials And Support Materials Comprising A Phosphor
KR20190134908	MIN CHANG KI [KR]	3D Printer After Treatment Machine
KR20190134931	SEOUL NAT UNIV R&DB FOUNDATION [KR]	Apparatus And Method Of Printing Active Variable Structure
CN110509558	UNIV KUNMING	3D Printer Using Saturated Nacl Solution As Support
US2019375006	GEN ELECTRIC [US]	Setter Assembly For Additive Manufacturing
JP2019206113	MAXELL HOLDINGS LTD	Support Material Composition
US2019366640	3D SYSTEMS INC [US]	Continuous Residue Removal Module For A Three-Dimensional Printing System

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Procesamiento de Datos

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
KR20200010634	SHIN ANSAN UNIV [KR]	3D-Printer Having Controller For Control Of Printing Conditions
US2020070413	FUJI XEROX CO LTD [JP]	3D Object Data Generation Apparatus
US2020070421	CARBON INC [US]	Robotic Additive Manufacturing System
EP3616887	CONCEPT LASER GMBH [DE]	Calibration Device For Additively Manufacturing
EP3616874	SULZER MANAGEMENT AG [CH]	3D Printing System for a 3D Object
JP2020027491	TOSHIBA ENERGY [JP]	Modeling Data Creation Apparatus, Programming For Modeling Data Creation Apparatus, Modeling Data Creation Method And Modeling Method
WO2020033124	VELO3D INC [US]	Aspects Of Three-Dimensional Object Formation
WO2020028431	PRELLIS BIOLOGICS INC [US]	Methods And Systems For Three-Dimensional Printing
WO2020032963A1	HEWLETT PACKARD [US]	Predicting Thermal Behavior In 3D Printers
EP3610970	CONCEPT LASER GMBH [DE]	Method For Calibrating An Apparatus For Additively Manufacturing
US2020049648	UT BATTELLE LLC [US]	Self-Sensing Of Printed Polymer Structures
DE102018121915	DYEMANSION GMBH [DE]	Process For The Surface Treatment Of Molded Parts
US2020047402	UNIV SOUTH CAROLINA [US]	Systems And Methods For Printing 3-Dimensional Objects From Thermoplastics
JP6644183	BRIDGESTONE CORP[JP]	Porous Structure and 3D Modeling Data
FR3084276	SAFRAN AIRCRAFT ENGINES [FR]	Powder Processing Device For Additive Manufacture, Additive Manufacturing System
EP3608085	CONCEPT LASER GMBH [DE]	Method For Operating An Apparatus For Additively Manufacturing
KR20200010652	HEPHZIBAH CO LTD [KR]	Method Of Determining The Layer-By-Layer Moving Speed of a 3D Printer
US2020023569	VALORBEC COMMANDITE [CA]	Method And System For 4D Printing Of Composites
WO2020018088	HEWLETT PACKARD CO [US]	Fluid Flow Devices For Printers

Nº PUBLICACION	SOLICITANTE Y PAIS ORIGEN	CONTENIDO TECNICO
KR20190143540	LEE HO HYUNG [KR]	3D Printer Pen Capable Of Measuring Distance
JP2020011474	RICOH KK[JP]	Modeling Apparatus And Method For Manufacturing Modeled Article
US2016236414	AREVO INC [US]	Method To Monitor 3D Process For Detection And In-Situ Correction Of Defects
JP2020001302	RICOH KK[JP]	Modeling Prediction System
US2016185044	MAKERBOT IND LLC [US]	Detection And Use Of Printer Configuration Information
US2020001529	SUGAWARA WATARU [JP]	Fabrication Prediction System
EP3587999	RICOH CO LTD [JP]	Measuring Device And Fabricating Apparatus
WO2020006260	3D SYSTEMS INC [US]	3d Printing System With Integrated Scan Module Calibration
US2019389135	MIMAKI ENG CO LTD [JP]	Adjustment Method Of Shaping Device
EP3587081	MIMAKI ENG CO LTD [JP]	Shaping Method
WO2019239530	NIKON CORP [JP]	Arithmetic Device, Detection System, Modeling Apparatus
WO2019239531	NIKON CORP [JP]	Computation Device
JP2019214183	CANON KK[JP]	Data Structure, Fabrication System, And Method For Controlling Fabrication System

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