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Energy sustainability **540 years**

since the first patent
granted in Spain



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CLIMATE SUMMIT

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This exhibition begins with the first patent for an invention registered in Spain, or more specifically the Crown of Castile, granted in the late Medieval period to Pedro de Azlor, doctor to Queen Isabella I of Castile, 540 years ago. This patent was one of the first in the world. The first patent granted represented a powerful privilege, as it gave its holder the right to make gristmills of any kind throughout the territories of the Crown of Castile.

Windmills are an element of great symbolic importance in the traditions and imagination of Spain, linking the past, present and future of Spanish invention in the use of wind energy; just as it did with the mills used centuries ago to grind grain into flour, the wind now moves the blades of turbines in wind farms, a sector where Spain has been a major innovator and is among the leading energy producers.

Following the thread of inventions relating to the use of wind power, we have selected six patents which formed part of important milestones in the history of Spanish invention: the first patent granted in Castile, patents granted under the Patents Acts of 1826, 1878, 1902, and 1986, and finally the most recent, presented just before the Patent Act of 2015 was passed, and put into practise this year by a Spanish company as a possible alternative to the future of wind energy - not only was this patent developed by Spanish inventors, it is considered to be the first of its kind in the world.

All the patents are wind powered, showing that the clean, non-polluting energy generated by nature itself has had

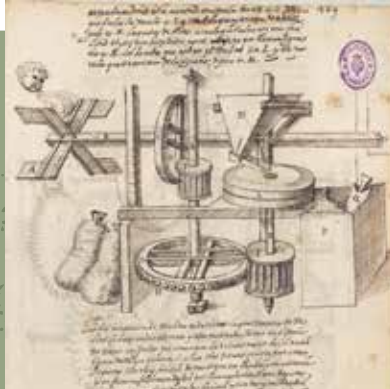
a wide range of uses, evolving over time according to people's needs and the development of society and the economy throughout our history. This fact shows that an old idea can have many different applications over time.

Highlighting the importance of wind power leads to a present-day issue which is increasingly pressing - the importance of finding and empowering inventions that relate to protecting and safeguarding our environment from the gradual destruction caused above all by the age of industry and capitalism. Thus we also hope to make the present and future generations aware of the importance of protecting the planet, generating ideas which guarantee our future and that of our environment.



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WHAT HAVE MILLS TRADITIONALLY BEEN USED FOR?

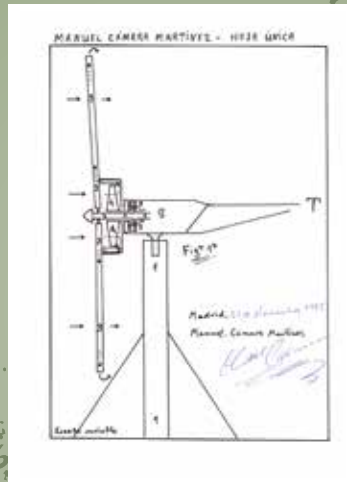


One of the most well-known uses of mills is grain milling. The mills have been used to grind different types of food such as cereals, spices, rice or cocoa.



The mills have also been used to raise water from wells or salt mines and to move sawmills. Both types of mills are very similar in their operation.

NEW USES OF THE MILLS

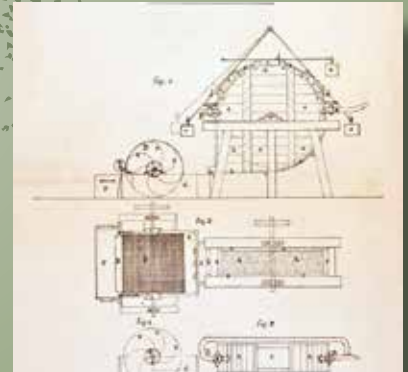


The development of electric power replaced the old millers' inventions.

Today the old idea of using wind power to generate energy comes back to replace production systems based on pollutants with more ecological systems.



The mills have been used to extract different types of oil: linseed, rapeseed, hemp. The mills used to extract the olive oil, which is widely used in Spain, are known as mills.



One use of the mills after the establishment of the printing press was the production mills to produce the raw material for the books. Spain was a great producer of paper during centuries.

THE FIRST PRIVILEGIO DE INVENCIÓN OF CASTILE, GRANTED BY QUEEN ISABELLA I

The first privilegio de invención, or invention patent, known to historians of Spain was granted by Isabella I of Castile to Pedro Azlor, her court doctor, in 1478, and it was indeed a privilege, giving him a monopoly of all gristmills in Castile.

It is possible that there were earlier invention patents, but they have not come down to us, as the conservation of public records decreed by law in the time of Alfonso X was not actually put into practice until the reign of the Catholic Monarchs.

This privilege gives Pedro Azlor the exclusive right to construct a grinding system for all types of mills, whether powered by water, wind or animal traction. These mechanisms appear throughout the history of Spanish invention, using the cleanest and least polluting forms of energy.

Spain sent much of its technological know-how to its American colonies, accelerating the economic and cultural development of the continent. The milling devices illustrated by Juanelo Turriano, the great inventor of the court of Charles I, were taken there by the early explorers to grind flour, sugar and cocoa, among other uses, transforming the technology of the pre-Hispanic cultures and leading to an unprecedented cultural and technological exchange. Pedro Juan de Lastanosa, in his book

Los veintiún libros de los ingenios y de las máquinas (21 books of engineering and machines), emphasised the revolutionary changes in the Americas when hand-cranked mills, or “molinos” as he called them, were replaced by the milling mechanisms developed in Spain.

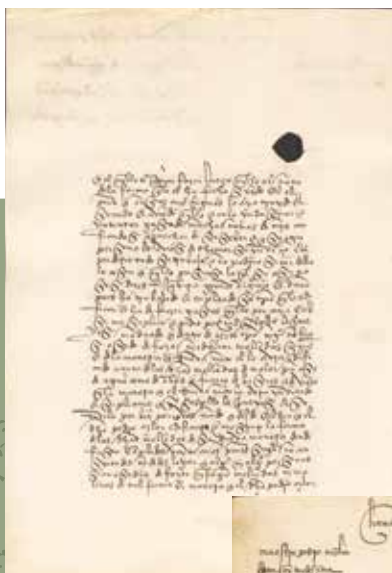
Transcription of the first patent according to Nicolás García Tapia:

“Sepades que el doctor maestre Pedro Azlor, my fisyco, me fizo relación que él quería inventar e fazer en mis Reynos e Señoríos nuevos edificios de molinos e molindas de molar pan, el qual dize que redundará en grand prouecho e utilidad de la cosa pública de mys reynos e señoríos, e que él se theme e recela que él, después de aver ynventado e mostrado las dichas molindas, que algunas personas veyendo su yndustria e borden que él en ello tiene, quieran fazer luego en ello otrotanto de la forma que él lo había fecho, siendo el primero que en estos mys reynos lo aya traydo e creado. E aviendo en ello e en lo yndustriar e ynventar gastado muchas costas de maravedís, confiando se aprovechar de su saber, e que sy otra persona le oviese de tomar su ynvención, él perdería todo su trabajo e no podría sacar dello la costa que en ello pusiese. Lo qual, si así pasase, diz que recibiría grande agravio e daño, pues ha trabajado e empleado su tiempo en lo edificar e ha de fazer gastos en ello, por cuya cabsa me suplicó e pidió por merced sobre ello le proveyese mandando que dentro de cierto tiempo ninguno no fuese osado de fazer ni edificar molindas segund e la manera que nuevamente él lo había edificado acerca de las dichas molindas de molar pan, asy de agua como de ombres, o fuerza de bestias o de viento, en la manera que él nuevamente lo había ynventado, e suplicóme que yo sobrello le proueyese. E yo túvelo por bien, por que vos mando que desde el día que el dicho Pedro Azlor edificare o mostrare la forma de las dichas molindas de su nueva manera, dende fasta complidos veynte años primeros siguientes, no consintades ni dedes logar que alguna ni algunas personas sean osadas de fazer ni fagan molindas ni molinos de tal forma que el dicho Pedro Azlor fziere”.

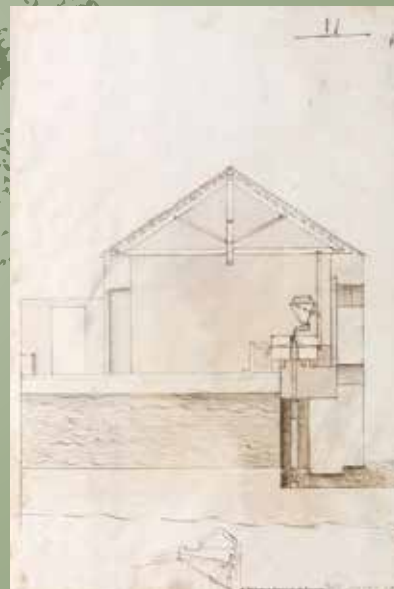


540 years

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España. Biblioteca Nacional. Sección de molino hidráulico. Anónimo español. Andalucía (s. XVI). Dibujos, grabados y fotografías. 1590. Biblioteca Digital Hispánica



España. Ministerio de Educación, Cultura y Deporte. Archivo General de Simancas. Patente de invención de molinos a Pedra de Azlor, médico y físico de la reina. Fecha: 24-02-1478. RGS.LEG.147802.26

THE FIRST PRIVILEGIO DE INVENCIÓN OF CONTEMPORARY SPAIN

The 19th century was characterised by the change in ownership of capital, as properties which once belonged to the aristocracy and the Church passed into the hands of a new middle-class oligarchy, partly through several confiscation processes in the 18th and 19th century. Some of the property changing hands were “las heredades de pan llevar”, the land where cereals were grown and mills were built to grind them, where production was slow due to the use of traditional systems and an archaic economy. Before the contemporary period, cereals were part of the trading system used to pay rent to the crown, the aristocracy, the church or the local government through such fiscal devices as the diezmo or tithe, where a tenth of the harvest was paid to the clergy, and the pósito municipal, where the community stored grain for times of need. This trade was transformed in this revolutionary era, giving way to new industrial and commercial customs. Despite the turbulent politics of the 19th century as conservative and liberal ideologies rose and fell, there was a steady change in agriculture as the old mills with their limited production capacity were replaced by new industrial flour mills.

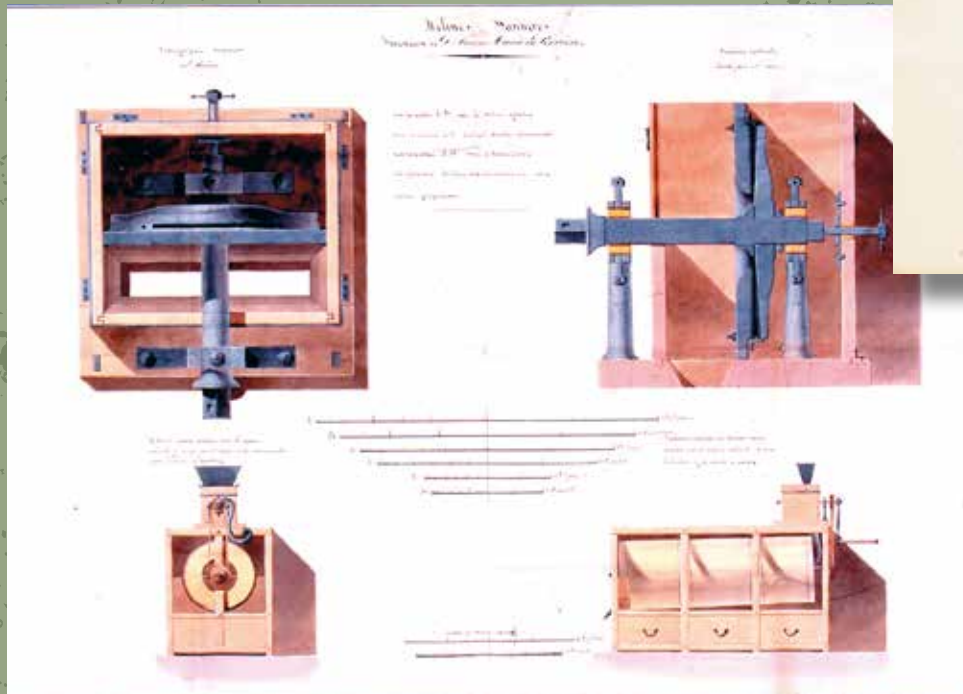
This transformation could not have happened without the new devices and inventions registered over the 19th century and processed according to the new Patents Act, published in Spain in 1826, influenced by French ideas and heralding a new era of change for inventions and their development. This law established the Real Conservatorio de Artes Ofi-

cios as the register of all files relating to patents applied for in Spain. The first invention presented for its protection was a mechanical flour mill, in an application filed by Juan María La Perriere on 26 March 1826. It is a curious fact that the first patent of the contemporary age was a gristmill, just like the first privilegio granted in the Crown of Castile 348 years earlier.

Over the course of the century, other inventions relating to flour processing would be presented, with improvements in the milling systems all over Europe reflected in new devices registered in Spain. The new inventions were developed to increase production and meet the rising demand of industrial development, while also improving the quality of the flour. These new systems included a windmill presented by Antonio Parodi on 21 April 1826; a vertical English flour mill presented by Gabriel Ibarzabal and Gaspar Urieta on 21 April 1828; a new mill presented by Mr Kaimbert on 11 August 1834; and a floating rotation mill presented by Joaquín Loresecha on 25 October 1844.



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Real Conservatorio de Artes
8 de febrero de 1826

Por este Real Conservatorio de Artes
se acuerda en el registro de la propiedad
al n.º 1. De las máquinas que se han
de dar a la vista de la propiedad
y facultad del establecimiento de
máquinas para moler trigo en las
máquinas que en las casas reales de la
ciudad se expresan que de acuerdo del
reglamento de la propiedad para dar
efecto con el n.º de la propiedad
a 8 de febrero de 1826

José M. de Arce

España. Oficina Española de Patentes y Marcas
Privilegio de Invención
Molino harinero mecánico (de brazo) para moler trigo. Rotación Vertical
Inventor: Juan María La Pierrre
Fecha: 26-03-1826
Número de Expediente: 1

SPANISH MILLS IN THE NEW PATENTS ACT OF 1878

The Patents Act of 1878 was passed in the context of a final rejection of the Ancien Régime and the establishment of capitalism as the new macroeconomic system of Spain. This change is reflected in the lower price of patent registration in order to encourage and drive a new system which would help grow the country's economy. Although late 19th-century Spain was still mainly agricultural, the new law supported inventions for industrial development, in a Spain which had long depended on external facilities and acquiring equipment from foreign companies for the new factories springing up all over the country in the preceding century.

In the late 19th century we see an unprecedented technological revolution, as electricity was installed in the cities. The municipal laws of 1870 and 1877 established that municipalities were responsible for the new energy, which allowed the streets to be lit for the first time, as well as lighting homes and factories, and ushering in modernity. Previously, more archaic systems had been used, such as oil lamps and gaslight. These methods were extremely dangerous, and inflammable building materials, and the lack of firefighting services and systems meant a fire could quickly become a catastrophe.

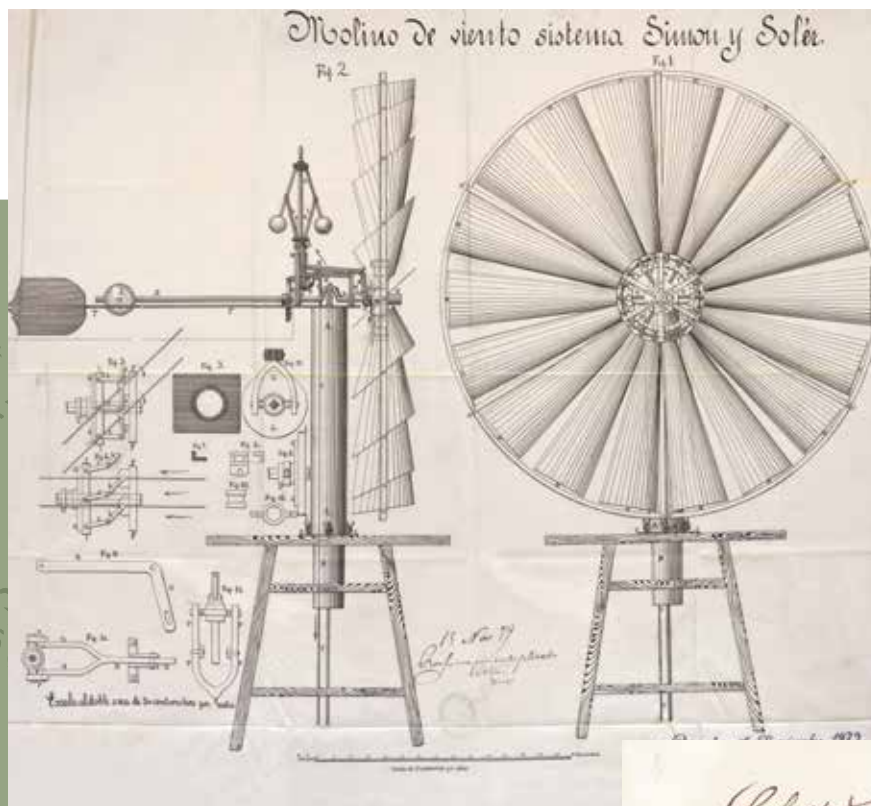
In the final decades of the 19th century the first electricity companies appear, supplying power at the local level, mainly in cities, as the energy generated in the form of a continuous current could not be transported long distances. Thermal or nuclear power stations did not yet exist, so at first the traditional resources of water and wind power were used,

which had also been used in the flour industry from ancient times, and steam power, recently established as an alternative for driving turbines and dynamos. In Spain, hydroelectricity would eventually emerge as the dominant energy source, giving rise to an extensive network of hydroelectric power stations with dams constructed all over the country. However, the first patent for a mill after the 1878 Act was a windmill or “aeromotor”, using wind power to generate energy. As this system could not meet the high demand for electricity, it was probably limited to domestic use, in this case for raising water. It is curious that this patent was filed in Spain before the first “aeromotor” was patented in the United States by Thomas O. Perry, where it was successfully distributed by the Aermotor Windmill Company which he founded in 1888.



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España. Oficina Española de Patentes y Marcas
 Privilegio de Invención
 Un molino de viento, sistema Simón y Soler.
 Inventores: José Simón Suriñach y Enrique Soler Camp
 Fecha: 11-11-1879
 Número de Expediente: P-644



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SPANISH WIND-POWER PATENTS IN THE EARLY 20TH CENTURY

The early 20th century began with a new Spanish Industrial Property Act, published on 16 May 1902, which covered all types of industrial property rights: invention patents, industrial drawings and models, and trademarks of all kinds. The 1902 law led to the establishment of the Industrial Property Registry. This law and the 1924 Regulation would be amended by Royal Decree-Law of 26 July 1929, which remained in force for a long time, until the new Patents Act, Law 11/1986, on 20 March 1986, and the new Trademark Act, Law 32/1988, on 10 November 1988.

In this period, mill-related patents continued to proliferate, and for the first time we see the name “aeromotor” or aero-engine, although the device was invented in the previous century.

The first aeromotor patent applied for based on this law was a special system with an aeromotor or windmill, filed by Antonio Planas Franch on 4 June 1908.

It is important to differentiate the concepts of the aeromotor and the aerogenerador or wind turbine: although both are based on using the wind to generate energy, they are quite different. According to the Royal Academy Dictionary, an aeromotor is an engine powered by moving air, while an aerogenerador is a device which transforms wind energy to electric power via rotating blades.

While patents are still being developed as the search goes on for wind-powered electricity generators, the 20th century would ultimately be characterised by other, more polluting but higher-capacity power sources to meet the needs of a growing urban population and growing industry, especially after the Spanish Civil War. In the post-war period the urgent need for production at every level led to the establishment of the first thermal power plants by the company Empresa Nacional Calvo Sotelo, S.A. Spain's industry and commerce were forced to develop quickly due to the need for self-sufficiency, as international sanctions isolated the dictatorship.

Somewhat later, nuclear power would be introduced in Spain, although efforts to develop it had begun as soon as the Francoist regime was established. In the post-dictatorship era, several new nuclear power stations were created, combining private enterprise and public funding.

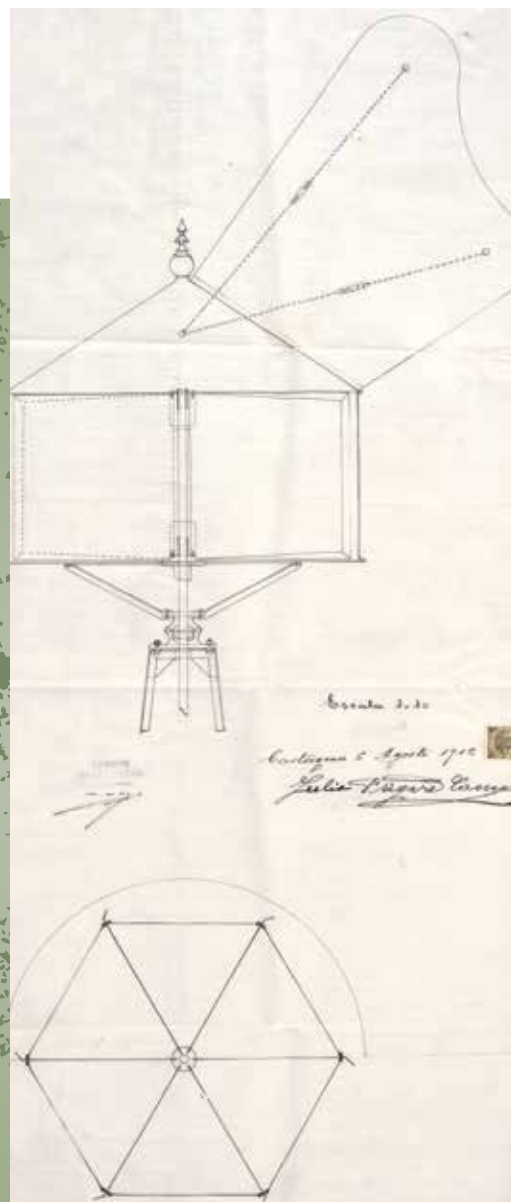


540 years

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España. Oficina Española de Patentes y Marcas
Patentes de Introducción
Nuevo sistema de molino de viento de orientación automática
Inventor: Jules Frigard-Canú
Fecha: 09-08-1912
Número de Expediente: P-053629



WIND TURBINES IN SPAIN, AN ALTERNATIVE TO NUCLEAR POWER

The 1986 Patents Act replaced the outdated law of 1929. This new law adapted Spanish regulations to the new European legislation, as Spain joined the European Economic Community the same year. This law eliminated introductory patents, which were not compatible with patent regulations in European law. Meanwhile, this law had ambitious goals including opening up the Spanish Patent and Trademark Office to the rest of the world with the creation of a Patent Archive, gathering patents from all over the planet, especially those written in Spanish. This idea became a reality through collaboration projects to gather and disseminate archives and documents of interest for the study of the history of technology and industrial property, and this work still continues in the Office.

In the 80s the old idea of using wind power as an alternative energy source came back into favour after the oil crisis of the 70s. In Europe, people began to protest nuclear energy and its consequences.

In this decade wind turbines were still very expensive, so governments began to subsidise research programmes to encourage their development and find alternatives to polluting power sources.

In Spain, patents for wind turbines had been filed since the 50s. These records were kept in the Spanish Patent and

Trademark Office, and can be consulted on the body's website. At the time they were filed, these patents were not considered as a way to generate electricity, because back then the dominant power source was fossil fuels, which were a source of wealth for many countries, with highly developed associated technology and research.

Spain needed a plentiful energy supply for its industrial and economic development, and created hydroelectric power stations and thermal power plants based on fossil fuels, which were also easy to obtain on Spanish territory, creating another productive sector: mining and extraction. One of the first patents to be filed after the new law was passed in 1985 was a wind turbine reactor by Manuel Cámara Martínez, who also registered another interesting patent called a "sail wind turbine", recalling the floating wind turbines now being proposed as a future wind power solution.



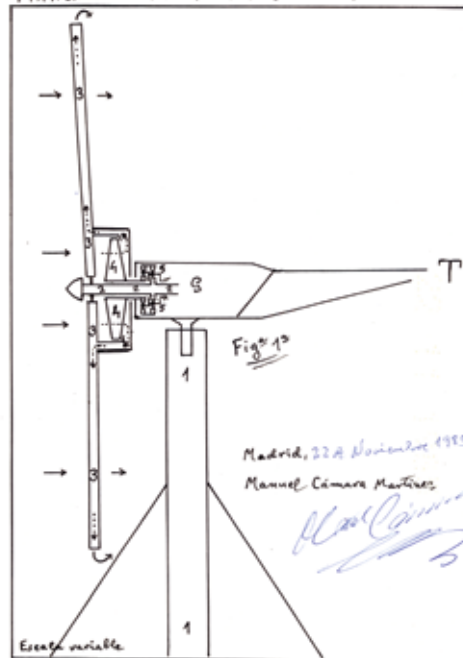
540 years
since the first patent granted in Spain



Parque eólico de El Hierro. Carlos Teixidor Cadenas, 2014

España. Oficina Española de Patentes y Marcas
Patentes Aerogenerador reactor
Solicitante: Manuel Cámara Martínez
Fecha: 01-09-1986
Número de Expediente: P-0549174

MANUEL CÁMARA MARTÍNEZ - HOJA ÚNICA



SPAIN, CREATOR OF THE FUTURE THROUGH WIND POWER INVENTIONS

The future of our planet depends on using wind power to produce electricity. Wind power systems have increased exponentially worldwide since the 80s. The current trend is to install ever larger turbines to make wind power a competitive energy as an alternative to pollutant energy sources.

We can differentiate two wind power systems currently in use: land-based turbines and marine turbines, and the latter in particular are being produced in larger sizes. The floating wind turbines used at sea are considered the best future option for this energy, because their impact on the environment is lower and they are less unsightly than land-based turbines.

Spain has been a pioneer in wind power research and development, and in establishing renewable energy in general. Spain leads the international ranking of countries getting a larger percentage of their energy from wind power, and Spanish wind turbine manufacturers are among the largest in the world. Wind power is the main source of renewable electricity generation in Spain and we are the second European country in terms of installed power, according to a 2017 report by Red Eléctrica de España. Spanish engineers have won national and international awards for their wind turbine designs.

Spain also recently installed the Canary Islands' first marine wind turbine, through the ELICAN project. One of the latest wind power related patents filed in the Spanish Patent and Trademark Office was for a floating marine wind turbine invented by Exponential Renewables, S.L. Another interesting patent filed with the Spanish Patent and Trademark Office, which may soon be going into production, is the world's first bladeless wind turbine, registered as a resonant vortex wind turbine in 2012 by Deuctecno, S.L. The patent has been under development by the company VORTEX BLADELESS, S.L. since 2018.

Wind energy, which 540 years ago powered the first gristmill designed by Pedro Azlor and granted a patent by Queen Isabella I of Castile, is still powering our world in the 21st century, and we expect it to be the energy of the future. In Spain, we see wind power as an opportunity to transform and improve our planet, because as the proverb says:

“When the winds of change blow, some people build walls and others build windmills”



540 years
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España. Oficina Española de Patentes y Marcas
 Patente: Aerogenerador Resonante por vorticidad
 Solicitante: DEUTECHNO, S.L.
 Fecha: 15-02-2012
 Fuente: INVENES
 Foto: Vortex Bladeless, Jorge Piñero Ramos

ES 2 374 233 A1

 OFICINA ESPAÑOLA DE PATENTES Y MARCAS ESPAÑA		 Número de publicación: 2 374 233 Número de solicitud: 201001003 Int. Cl.: F03G 7-06 (2006-01) F03D 5-06 (2006-01) F03D 3-00 (2006-01)
SOLICITUD DE PATENTE A1		
Fecha de presentación: 02.08.2010		Solicitante: Deutechno, S.L. C/ Puerto de Madrid, 171 - 2da. Pl. P.D. 28028 Madrid, ES Abogado: Sobornada e Inocencio, S.L.
Fecha de publicación de la solicitud: 15.02.2012		Inventor(es): Yafes Villarreal, David Jesús
Fecha de publicación del folio de la solicitud: 15.02.2012		Agente: Hernández Perea, Silvia
Título: Aerogenerador resonante por vorticidad.		
Resumen: Aerogenerador resonante por vorticidad. Aerogenerador que consiste en un anillo al que se le hace girar y un rotor que funciona de colector natural se ajusta de manera diferencial a la frecuencia con la que aparecen los vórtices o remolinos de aire producidos tras la colisión de un flujo de aire laminar y establecimiento sobre su superficie. La energía cinética del alabado se transforma en energía eléctrica gracias al uso de materiales con alto coeficiente piezoelectrónico.		
		 Fig. 1

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COVER AND MILL IMAGES

Exterior of a windmill in El Almendro. Instituto Andaluz del Patrimonio Histórico. Repository: EUROPEANA COLLECTIONS.

El Hierro wind farm. By: Carlos Teixidor Cadenas. 2014. Creative Commons license. CC BY-SA 3.0.

Trademark no. 171. Date: 12/06/1873. Title: Molino de Viento. María de los Dolores Montllor Gosálvez. Alcoy (Alicante) (Spain)

Trademark no. 7367. Date: 01/03/1900. Title: Don Quijote. Andrés Roldán Tebar. Santander (Cantabria) (Spain).

Trademark no. 11378. Date: 28/11/1904. Title: Molino. Joaquín Martins y Compañía. Uruguay (Montevideo).

Trademark no. 11673. Date: 17/03/1905. Title: El Molino. José Antonio Navarro Hernández. Murcia (Spain).

Trademark no. 14576. Date: 14/01/1908. Title: Molino. Jesús Peñas Pérez. Seville (Spain).

Trademark no. 19328. Date: 18/05/1911. Title: El molino. Enrique Bosch. Campo de Criptana (Ciudad Real) (Spain).

Trademark no. 32892. Date: 27/05/1918. Title: Cervantes [El Molino]. Juan Panisello Cugat. Tortosa (Tarragona) (Spain).

Spain. Biblioteca Nacional. Lastanosa, Pedro Juan. Los veintitún libros de los ingenios y de las máquinas. 1601-1700. Tomo III. Repository: Biblioteca Digital Hispánica.

Spain. Oficina Española de Patentes y Marcas. Privilegio de invención. Plan of machine for making paper from wood pulp. Applicant: Ernest Autreux. Date: 11/04/1855. File number: 1277.

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Databases of the history website of the Spanish Patent and Trademark Office in partnership with the Autonomous University of Madrid. <http://historico.oepm.es/index.php>.

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SCRIPT AND TEXT

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ACKNOWLEDGEMENTS

Vortex Bladeless (Jorge Piñero Ramos)
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Biblioteca Nacional de España
Equipo de Investigación de la Universidad Autónoma de Madrid

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