



THE THIRD DIMENSION

Journey of Hologram



Where Inventions Live Long



The early cave paintings and Chinese magic mirror attest the fact that man has always been very fascinated about creating image and using interference of light. Holography was born at the time of Indian independence, but became a real technological possibility when laser was invented in 1960. The technology has been visualized many invisible avenues and seems to have advanced rapidly in recent times, as holograms have started appearing everywhere: on credit cards, magazine covers, advertisements and medical images, to cite a few.

Industry Overview

The United States represents the largest regional market for industrial applications of holography worldwide. Europe and Japan are the other major holography markets. According to Expresswire, over the next five years the hologram market will register a 27.3% CAGR in terms of revenue, the global market size will reach USD 120 million by 2024, from USD 29 million in 2019.

According to Market Research Future, the hologram market in India is constantly increasing with an average growth rate of 19% per annum in last 5 years. It is further projected to grow at 19% CAGR for the next 5 years as there is a huge demand of holographic features in various sectors. The increasing need for enhanced security and protection of consumers from counterfeit products as well as quality services, reasonable price, increases in export are the reasons behind this constantly growth.

Key Points

- India is one of the most dynamic markets for holography and various authentication products;
- India is a major producer with more than 40 domestic companies producing holograms;
- Alcohol excise sector fastest growing sector of the Indian market;
- 20% of the holograms produced annually are used by drug and cosmetic producers as an integral part of their brand authentication programmes; and
- Consumer goods and automotive vehicle components were also important markets for holograms with 8% and 3% market share respectively.

Key factors propelling market growth include: increased efforts by government and industries to curtail counterfeiting, piracy, and other issues; foray of holography in niche areas, such as solar weather forecasting, 3D information storage, and sound projections; and the use of holograms in specialized applications, including aircrafts, medical, automobiles, television, telecommunications, computing and designing of assembly and scanning.

Major Players

The Indian holography market is characterized by the presence of several vertically integrated companies, and is led by private companies, mostly from the engineering, mass storage media, security, advertising, and medicine fields. There are close to 100 organizations irrespective of company size working in holography in India. India is a major producer with more than 40 domestic companies producing holograms. Major players being Holostik, Shriram Veritech, Light Logics, Kumbath Holograms, Everest Holovision, P.B. Holotech, Holoflex, Lasersec, Secure Grafix, Kuwer Industries, Bajaj Holographics, Kantas Track Pack, Uflex, Kiran Holography and Alpha Lasertec.

ASPA, Authentication Solution Providers Association of India, is a nonprofit organization established in 1998 to represent and promote the interest of hologram industry in India as well as to fight against counterfeiting. Affiliated with International Hologram Manufacturers Association (IHMA), UK, it is the only second body of its type in the world.

Global Counterfeits

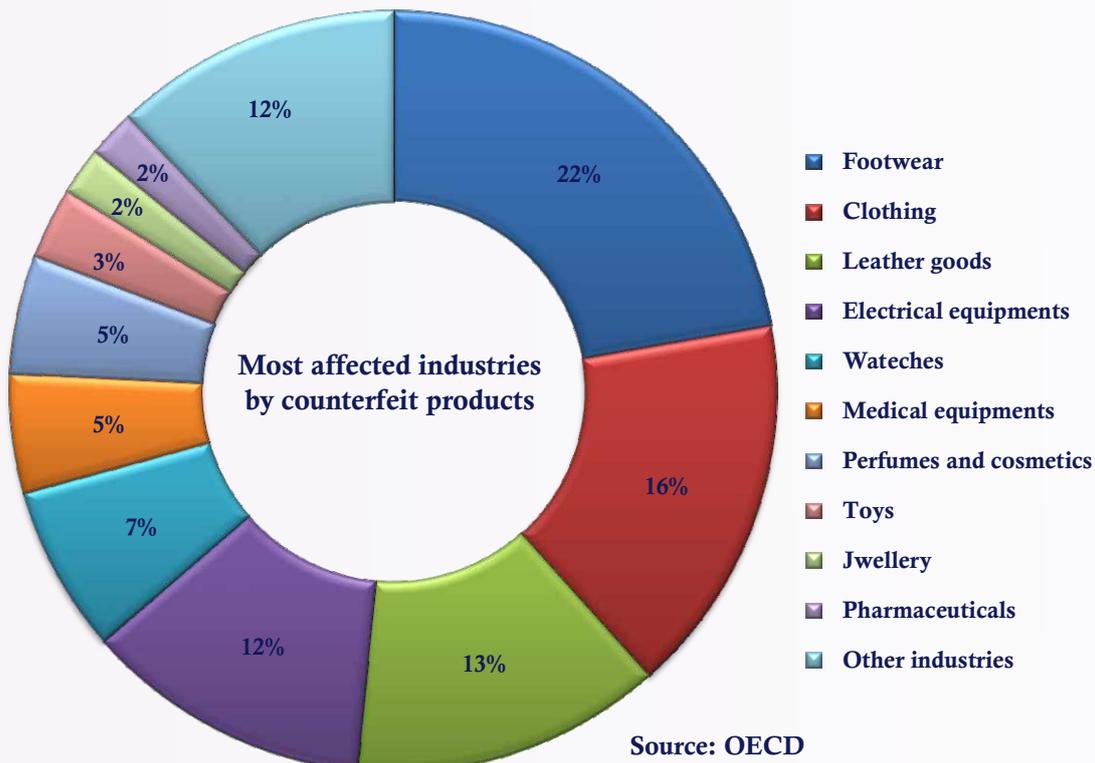
- In 2018, counterfeit goods caused around \$323 billion of loss to the global economy.
- According to The Global Brand Counterfeiting and Trademark Infringement Report, the amount of total counterfeiting globally is bound to reach 1.95 Trillion USD by 2022.
- In 2016, around 51% of all counterfeits came from China, around 9% from Southeast Asia and 4.5% from Eastern Europe.
- According to the report, Asia Pacific accounts for more than 50% of the total counterfeited products that are being sold online.
- According to the report, more than 22% of the 3D printers are somehow linked to production of fake products and prototypes.
- Around more than 25% of consumers unwillingly purchased counterfeit goods online.
- According to U.S. Government

Accountability Office, two out of every five brand name products they bought online through 3rd party retailers were counterfeits.

- Most common knockoff goods were Makeup (32%), Skincare (25%), Supplements (22%) and Medication (16%).

Indian Counterfeits

- India and China are the largest producers of counterfeit goods.
- The USTR report said almost 20 per cent of all pharmaceutical goods sold in the Indian market are counterfeit.
- According to the Annual Anti-Counterfeiting and Brand Protection Summit, the Indian counterfeit market is worth over INR. 40,000 crore.
- Approximately 3 billion pieces of counterfeit and pirated products were seized in 2013 in India which comprised of 2.3 billion pieces of illicit pharmaceutical products, 470 million pieces of electronic appliances and 50 million pieces of foodstuff.



Intellectual Property

Improvement and innovation are the key factors for the success and survival of any business. Intellectual Property Rights and associated strategies are always considered as path of evolution for any organization whether it's an old and big organization or a small organization or an upcoming organization. The most common ingredient of evolution of all business giants is their Intellectual Property (IP) and its proper & strategic protection followed by enforcement and commercialization. IP has become an integral and essential part of business plans and budgets of many business houses.

Intellectual property protection in holography has been an integral part of business since Dr. Gabor's invention of the theory of holography in 1947. The beginning of 1970s when the first holographic material patents have appeared and in the course of the last 50 years thousands of patents have been filed which are creating valuable assets for their owners. Besides protecting their owner's products, these patents are valuable possessions that can be licensed, sold, leased, and used as collateral for business financing.

Intellectual Property Rights played an important role in keeping the right pace of development and proliferation of authentication technologies worldwide too; and in return provided a successful business tool to the innovators and creators of the technology.

Correlation of Counterfeiting with IPR

Any type of counterfeiting, directly or indirectly, affects different Intellectual Property Rights of the concerned right holder. Counterfeit products resemble the patented, copyrighted and/or trademarked goods as they are sold under the similar/same brand names of the products being counterfeited and violate their IP protection.

1. **Patent Infringement:** Patent infringements take place when anyone sells, manufactures or imports any product protected under Patent laws in a particular jurisdiction.

2. **Design Infringement:** Counterfeiting can be done for design rights by copying the shape and outer configuration of a product or utility patents by providing a knockout inferior product.
3. **Copyright Infringement:** Copyrights are intended to provide protection to the creator of original work which can be photos, books, artwork of holograms, publications, graphic designs, songs, movies and other artistic works. When a copyrighted work is reproduced, publicly displayed or distributed without the copyright owner's permission, it amounts to copyright infringement.
4. **Trademark Infringement:** A trademark is a recognizable sign, symbol, name or logo for a particular product or service for a brand. When the trademark is used without the authorization of the trademark owner, trademark infringement occurs.

Hindustan Unilever, a consumer goods firm, has averaged filing about two cases of violation of its intellectual property rights (IPR) and trademarks weekly in FY19, in an attempt to remove counterfeit products using similar logos or packaging as HULNSE brands and sold at very low prices.

Innovation in Authentication

Authentication is a very old method. As time passed, people started offering authentication services and also started protecting rights in their inventions in authentication field. We have patents in authentication related innovations since late 80s. This is an area which requires constant innovation because if security features become old, they can be easily used by counterfeit manufacturers too. So, there is high demand of bringing new invention in this field of authentication. Since last 5 years the patent databases are full of patent applications with multi featured authentication features from optical security to track and trace system.

Initial Patents in Authentication

One of the oldest patents disclosing authentication features, was CH9699A entitled “Safety lock for boxes, doors, furniture etc.” filed in 1892 by Freyberger Heinrich in which he disclosed a Safety Catch for Pack crates for providing Security against unauthorized Opening.

Patent application GB189719783 published in the year 1897 titled “Improvements in printing inks” filed by Webb Richard, was based on security ink.

Patent application GB189910803 published in the year 1899 titled “Improvements in coin-testers for coin-freed machines” filed by Reiner Philipp and Pelzer Joseph, was based on detecting coin counterfeits.

Patent application GB189909307 published in the year 1899 titled “Improvements in protected or seal fastenings for boxes or cases” filed by Howard Joseph William, was based on

Tamper-resistant packaging where the boxes or cases were secured in such a way that the seal fastenings cannot be withdrawn and has to be destroyed to open the box.

Major Breakthrough

The major innovations for holograms started with Dr. Gabor's invention of the theory of holography in 1947 for which he received the Nobel Peace Prize. In 1960, Theodore Maiman invented the ruby laser, considered to be the first successful optical or light laser. In the 1970s there was very little technical development. However, in this decade Kodak invented the digital camera and Nikon developed the lens on the concept of optical laser. In 1972 artists and scientists worked together to create commercial & creative applications of holography. Lloyd Cross created the Kiss Hologram made from a series of 380 film frames.

Dr. Stephen Benton at Polaroid received a patent for white light holograms which allowed holograms to be viewed with spot lights rather than large expensive lasers. Holograms have been in the popular imagination since that moment early in the 1977 blockbuster Star Wars where Princess Leia's desperate message to Obi Wan Kenobi popped onto the silver screen. Holograms were a new idea of the times. They weren't quite at the level of the film, but the 1970s were the big start of the 3D holographic industry and the 3D lenticular industry. By the early 1980s, embossed holograms were used for security on credit cards & National Geographic put embossed holograms on the cover of 3 issues.

National Geographic (1984)

National Geographic becomes the first mass circulation publication to put a hologram on its cover.

CNN (2008)

During election-night coverage, CNN “beams up” on-location correspondent Jessica Yellin into its studio.

Tupac Shakur (2012)

Deceased rapper Tupac Shakur materializes on stage at the Coachella outdoor music festival. Musion Systems owns the patent on the Mylar-screen process that was used to project the hologram onto the stage at Coachella, and AV Concepts is a licensee on that patent. MDH Hologram was the first company to master photorealistic and flexible hologram technology for performance venues.

PM Narendra Modi (2012)

Narendra Modi scored first who uses 3D telecast to address audiences in four cities. In his speech, telecast on specially erected screens in Ahmedabad, Vadodara, Rajkot and Surat with the help of 3D holographic technology and satellite link-ups.

Current Technologies of Holography

1. The Aerial Burton Laser Plasma Holograph: A company known as Aerial Burton has created a holographic projector that uses a plasma laser to float a 3D image in mid-air.
2. Pepper's Ghost: This is using high-end motion capture technology and full 3D CGI which completely recreate a person from head to toe, then projects them into a nearly invisible pane of glass.
3. Fan Type Holograms: They work using

small propellers merged with high tech RGB lights to create fully HD images over 3 meters tall while using a mere 65 watts of power.

4. Light Field Display Holograms: This technology allows a user to interact with the hologram just like they might with a real object or touchscreen.

5. Digital Holographic Tabletop: A hologram capable of being viewed simultaneously in 360 degrees by using a series of multi-colored, high powered lasers and a high-speed rotating mirror display.

6. Physical Holograms: Through this technology 900 motor driven columns in a tiny area are capable of sculpting shapes in real time.

7. No-logram: The technology uses 2D projections paired with a motion sensor to give the impression and functionality of a 3D image that is incredibly high-definition and realistic feeling extensively used by magicians and filmmakers.

8. Table Holograms: A multi-user system that coordinates atoms of light with an incredible algorithm that can handle 1000GB of graphics data, creating stunning visuals.

9. 3D Volumetric Technology: 3D volumetric technology brings digital content to life and helps empower people to visualise, communicate, learn and have fun in a collaborative manner with no barrier to the 3D experience.

10. Fairy Light: This technology can create 3D images with resolutions up to 200,000 dots per second.

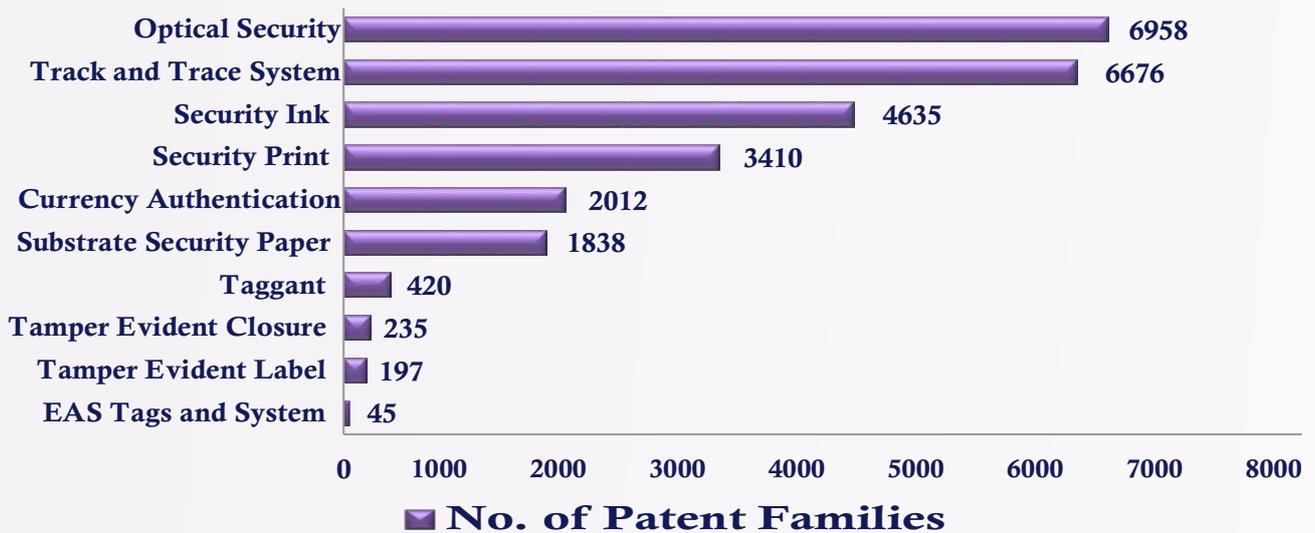
Patents Trends in Authentication

Certain broad key terms related to authentication technology were executed by Patentwire on database [Questel Orbit, 19-06-2019] and following trends were observed in output patents/applications in the domain of authentication.

Patent Trend in Authentication Technologies (Worldwide)

The technologies which are prevalent in the field of authentication are - EAS Tags and System, Tamper Evident Label, Tamper Evident Closure, Taggant, Substrate Security Paper, Currency Authentication, Security Print, Security Ink, Track and Trace System and Optical Security. According to our observation, “Optical security” and “Track and trace system” are the most used technology in patent publications authentication innovation domain. Optical security is leading technology in authentication due to highly useful holography techniques. Hologram technology offers three levels of security – covert, overt and forensic hence it is the security features of choice for securing the critical personal data in a passport or on an ID card against tampering, alteration, forgery or counterfeiting.

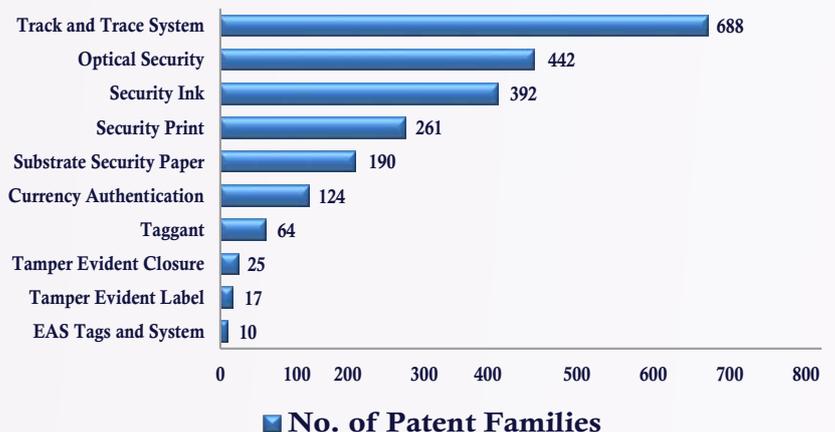
Anticounterfeiting Technologies Vs No. of Patent Families (Worldwide)



Patent Trend in Authentication Technologies (India)

The search was conducted using same parameters as used worldwide, but only India was opted as the Publication jurisdiction. According to our observation, here also “Optical security” and “Track and trace system” are the most used technologies in patent publications in authentication innovation domain.

Anticounterfeiting Technologies Vs No. of Patent Families (India)





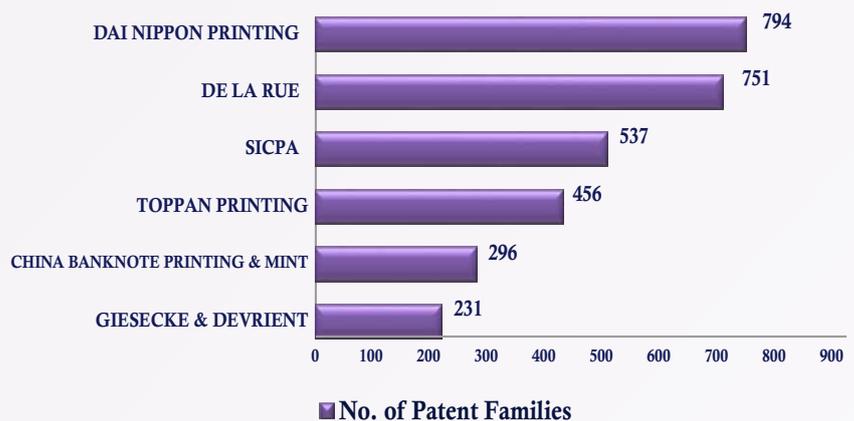
Assignee Trend (Worldwide)

Dai Nippon Printing, De La Rue and SICPA are the top assignees to file patent applications in the domain of authentication worldwide.

Dai Nippon Printing, a Japanese printing company, established in 1876, operates its printing in three areas; Information Communications, Lifestyle and Industrial Supplies, and Electronics.

De La Rue, a British company headquartered in Basingstoke, England, founded in 1821 by Thomas de la Rue, who set up in business as a stationer and printer.

Top Assignee Vs No. of Patent Families (Worldwide)



SICPA S.A., based in Prilly, Switzerland, operates as a subsidiary of SICPA HOLDING SA and provides security applications, such as banknotes, official identity documents (passports, identity cards, birth certificates, etc.), postage stamps, tax banderoles, security labels, and product markings.

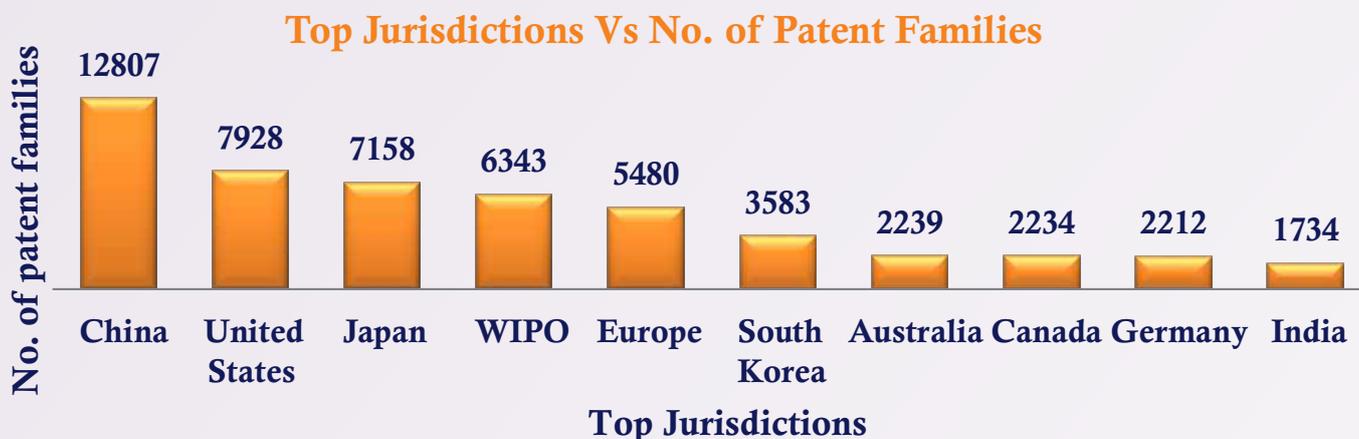
ASPA Members, Contribution in Innovation in Authentication:

De La Rue and SICPA are having abundant patent in their accounts. But the total patent applications filed so far from other ASPA members cumulatively, is below 200. [Questel Orbit; 08-07-2019; 151 total results, when All ASPA members were kept as assignees (excluding De La Rue and SICPA)]. However when these 151 patents were analysed for their technology, only 31 patents were filed in the field of authentication.

In ASPA members, De La Rue has more than 750 patents; SICPA has more than 500 patents, and then comes Manupal technologies with 12 patents in authentication followed by Pharmasecure with 7 patents in authentication.

Jurisdiction Trend

China is leading jurisdiction in filing patents for authentication related technologies, followed by United States and Japan.



Recent Trend

More than 50% of the patents have been published in last 5 years. However the technology trend remains the same as Track and trace and optical security technologies are leading in the recent innovation trend too followed by security inks. This indicates increased interests in authentication related innovations in recent years. Increased counterfeiting due to increased online shopping sites has also made the innovators to find new ways to deal with counterfeit products and hence resulted in abrupt innovations in authentication field in last few years.

Key Highlights of IP Landscape on Authentication

- Optical security and Track and trace system are the most used technology in patent publications authentication innovation domain.
- De La Rue, SICPA and Dai Nippon Printing are the top assignees.
- China is leading jurisdiction in filing patents for authentication related technologies, followed by United States and Japan.
- More than half of the publications in authentication came in last 5 years.



De La Rue: From Playing Cards to Banknotes

De La Rue, a British company headquartered in Basingstoke, England, founded in 1821 by Thomas de la Rue, who set up in business as a stationer and printer. In 1831 he secured his business a Royal Warrant to produce playing cards. In 1855 it started printing postage stamps and in 1860 it began printing banknotes. It was first listed on the London Stock Exchange in 1947. This company is a plethora in the authentication market and generated cash flows of £73.5m from operating activities in 2017/18 and working with over 140 countries. The main reason of De La Rue's success is its continuous innovating strategy. De La Rue has more than 1000 patents as assignee, has invented over 100 security features for currency and registers around 30 patents per year which shows they are the keen in bringing new innovation in the authentication area. "Drive change and innovate" is De La Rue's main mantra for success.

Major highlights from De La Rue's Journey

- De La Rue has a fascinating history in 200 years from playing card production to the world's first ATMs.
- In 1813, Thomas de la Rue launched his first commercial venture of print business, the newspaper Le Miroir Politique on Guernsey.
- In 1855 De La Rue started security print business and received its first postage stamp contract, for the Fourpenny Carmine.
- In 1860 De La Rue printed its first ever paper money for the Government of Mauritius, representing a milestone in both design and security.
- In 1959, De La Rue set up Security Express Ltd with Wells Fargo, to offer secure delivery to those handling money and other secure items.
- In 1967, De La Rue jointly developed and installed the world's first through-the-wall ATM at Barclay's Bank in Enfield, UK.
- In 2013, De La Rue won the Queen's Award for Enterprise: Innovation for its super wide Optiks banknote security thread with a clear window in the banknote, and the associated paper making process.
- In 2016, De La Rue acquired DuPont Authentication, a leading global producer of photopolymer holographic films, 3D holograms and associated software.

Conclusion

Holography by its nature tells an amazing story of its development and its integration of modern science and technology. Through its development journey, the technology created new communities and flourished with them. Its progression from Cinematography to Authentication has been distinctly different from what their creators might have expected. Through its fascinating journey, the technologies of holography imbibed with modern sciences, emerged with more realistically applications, and perspired their future trajectories.

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