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ANALYTICAL ALGORITHM FOR MONITORING THE READINESS OF SMART TECHNOLOGIES

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Abstract

In the context of modern smart manufacturing, a patent and licensing strategy is formed as a control analytical algorithm for monitoring the technology's readiness for mass production and integrated marketing.

New smart manufacturing solutions have a positive impact on the development of most production systems and equipment. Their efficiency is enhanced through vertical and horizontal integration. The proposed technical solutions are based on a method of coding and subsequent identification of the coding element. The method involves applying a special coating (or its technological equivalent) to an object and measuring its thickness. Matching the parameters with the specified code ensures positive identification, while mismatching leads to shutdown or blocking of the equipment or information consumer.

This technology has been repeatedly proven in film thickness control applications in solar energy and semiconductor manufacturing. With the advent of multilayer optical discs and recording formats using blue lasers, its importance has increased. Coding at each recording level enables three-dimensional local encryption of information, making the technology particularly relevant for protecting classified and confidential data. In conclusion, it should be noted that new smart manufacturing technologies have a positive impact on the comprehensive development of virtually any production systems and equipment, as well as on their improvement through vertical and horizontal integration.

Keywords: *control analytical algorithm for monitoring the readiness of smart technology for mass production and integrated marketing, patent and licensing strategy, innovative technologies, mass-market products, vertical and horizontal integration*

Patent and licensing strategy as a control analytical algorithm for monitoring the readiness of smart technology for mass production and integrated marketing.

In recent years, innovative high-tech fields have rapidly evolved into mass-demand products. These include smart design, medical devices, transportation, logistics,

manufacturing equipment, and workforce development systems. A key challenge is ensuring these technologies are secure, scalable, and market-ready. One example is mobile security coding for external digital storage media, which demonstrates how technical innovation connects directly to patent strategy and commercialization.

The essence of this technology lies in a coding and decoding unit that ensures highly accurate identification of protected elements. This is achieved by applying a special coding coating (or disk) whose thickness determines accuracy. Two main methods exist:

1. Manufacturing the disk from precision foil.

2. Applying an electrochemical coating into a housing groove.

Identification occurs by measuring the coating thickness. A match confirms authorization; a mismatch halts device operation. Thickness ranges from 1 to 50 microns, making the system both simple and reliable.

The coating method has already been tested in semiconductor manufacturing and solar panel production. Its adaptation to data storage addresses the growing risks of information theft, especially with multilayer optical discs and high-capacity devices. Each disc layer can be individually coded, enabling selective protection of sensitive information.

Models of storage media show that the system can be integrated into both existing and new devices, strengthening their marketing value. Beyond storage media, the method supports modules for cooling, monitoring, and controlling energy-intensive optical and electronic systems.

The manufacturing process includes:

1. Preparing steel tape, applying photoresist, and using high-speed electrochemical coating of nickel and copper.

2. Selective iron etching, polymer stabilization, and vacuum coating with nanoscale diamond films.

This advanced jet electrochemical process creates durable, conductive structures without organic additives, offering cost efficiency and high performance.

When deployed in a corporate environment, this coding system provides multilayered data protection. It enables real-time tracking of each storage device's location and status, reducing risks of unauthorized access. This approach can be applied to both optical media and mobile storage, supporting scalable corporate information security systems.

At least two major projects arise from this technology:

1. Optical storage device coding – integrating analytical and sensor devices for industries requiring high data protection.

2. Mobile external storage coding – enabling portable security with mobile or stationary analytical systems.

Both directions offer wide applications in IT, healthcare, defense, and logistics.

Additional technological features

The technological challenges of applying special coatings have been resolved, and this technology has been repeatedly tested in similar applications related to film thickness control on solar panels and in traditional semiconductor manufacturing. Additional features and potential applications of this technology, applied to the new conditions that have emerged in the storage media market over the past year, taking into account new trends in technical solutions and technical systems at all levels, ultimately lead to the synthesis of so-called smart technologies and integrated technical systems with elements of artificial intelligence and artificial neural networks.

With the emergence of new formats for recording and reading optical storage media using blue lasers and the start of production of multilayer optical discs based on this same technology, the proposed principles and technical solutions for security coding have become even more important, as the amount of information recorded on each disc increases, and the lack of protection leads to increasing losses of classified or confidential data. In addition to the information already transmitted, it is necessary to indicate the capabilities for coding each layer in multilayer discs, in which each level of the recording layers is coded, which is a significant improvement in the system of formatting an optical storage medium in three-dimensional terms and is a means of ensuring (for particularly important and secret information) local selective coding of information within a single disc.

Overall, the described system demonstrates how patentable innovations not only improve technical performance but also provide a foun-

dation for marketing and licensing strategies. By combining precision engineering, advanced coatings, and adaptable security mechanisms, these solutions can accelerate the readiness of smart technologies for mass production. Integrated with corporate and governmental security systems, they ensure both commercial viability and long-term competitiveness.

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