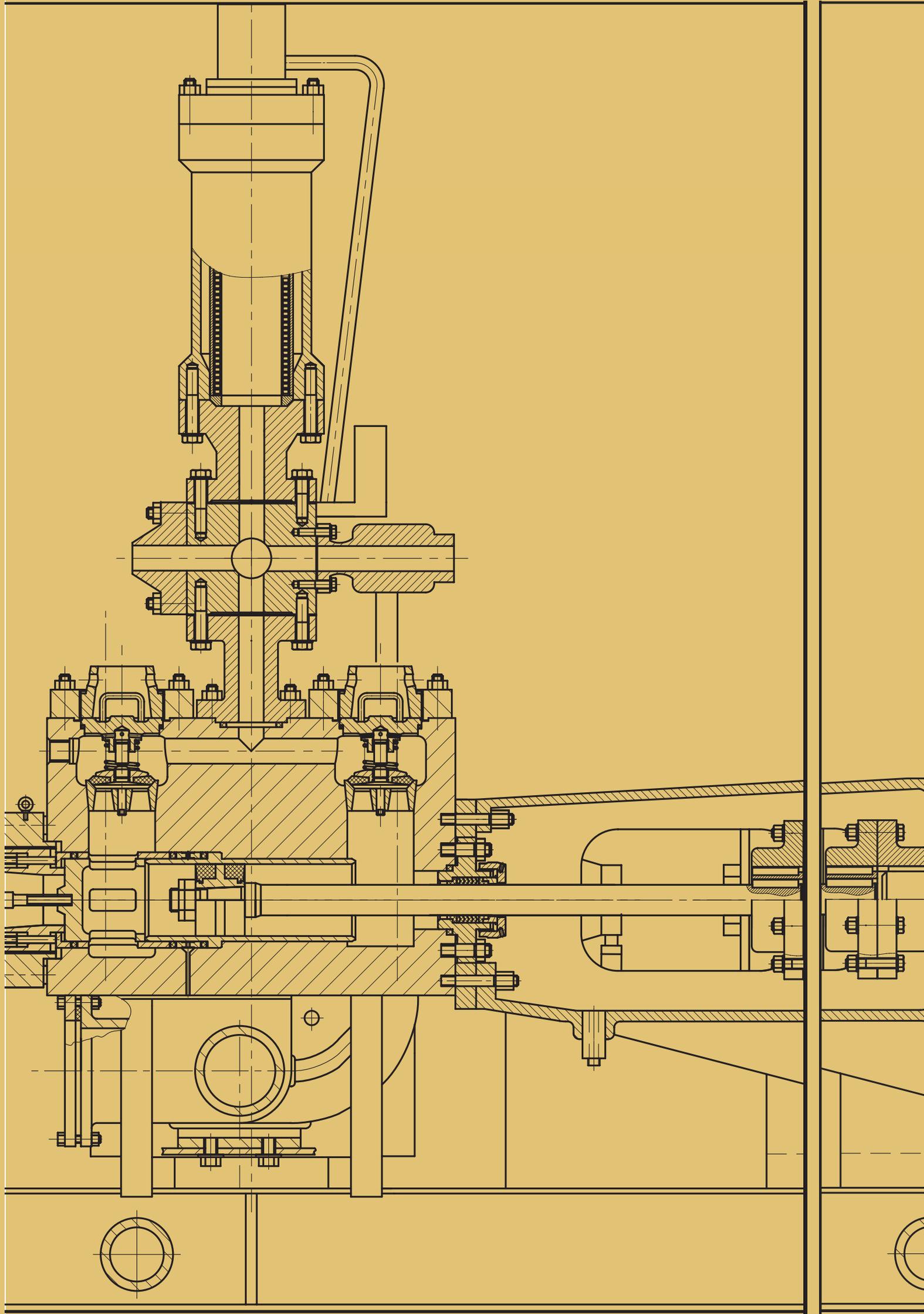
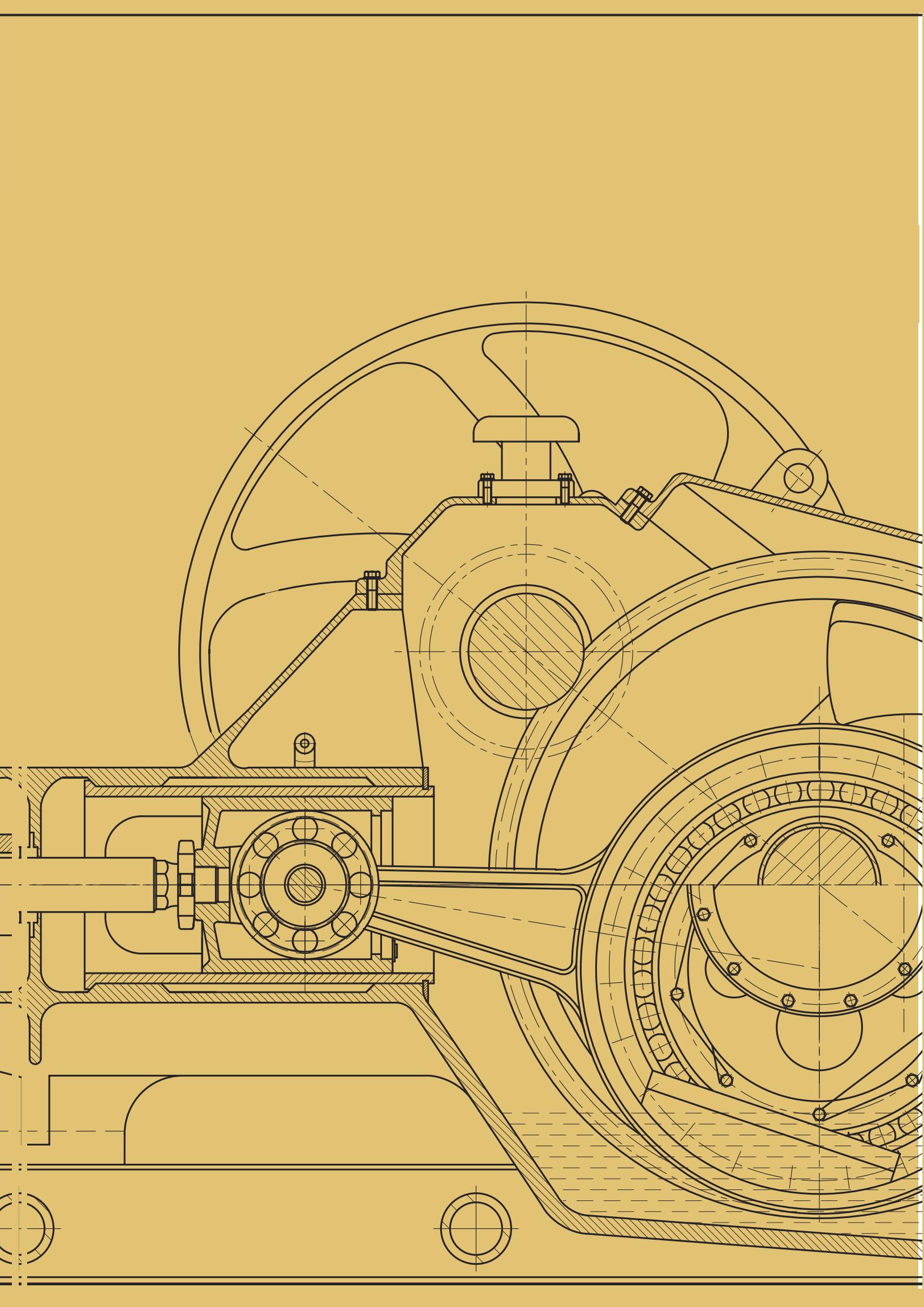




**TECHNOLOGY
TRANSFER
OFFICE**

**TECHNOLOGY ANNOUNCEMENTS
CATALOG 2016**





the \mathbb{R}^n is a linear space over \mathbb{R} with the usual addition and scalar multiplication. The inner product is defined by

$$\langle x, y \rangle = x_1 y_1 + x_2 y_2 + \dots + x_n y_n \quad (1)$$

where $x = (x_1, x_2, \dots, x_n)$ and $y = (y_1, y_2, \dots, y_n)$ are vectors in \mathbb{R}^n .

The norm of a vector x is defined by

$$\|x\| = \sqrt{\langle x, x \rangle} = \sqrt{x_1^2 + x_2^2 + \dots + x_n^2} \quad (2)$$

The distance between two vectors x and y is defined by

$$d(x, y) = \|x - y\| = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + \dots + (x_n - y_n)^2} \quad (3)$$

The angle between two vectors x and y is defined by

$$\cos \theta = \frac{\langle x, y \rangle}{\|x\| \|y\|} \quad (4)$$

The orthogonal projection of a vector x onto a vector y is defined by

$$\text{proj}_y x = \frac{\langle x, y \rangle}{\|y\|^2} y \quad (5)$$

The orthogonal distance from a vector x to a vector y is defined by

$$d(x, y) = \|x - \text{proj}_y x\| \quad (6)$$

The orthogonal distance from a vector x to a subspace S is defined by

$$d(x, S) = \inf_{y \in S} \|x - y\| \quad (7)$$

The orthogonal distance from a point x to a line L is defined by

$$d(x, L) = \inf_{y \in L} \|x - y\| \quad (8)$$

The orthogonal distance from a point x to a plane P is defined by

$$d(x, P) = \inf_{y \in P} \|x - y\| \quad (9)$$

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PREFACE

Director's Message

One of the primary goals of Technology Transfer Office (TTO) Özyeğin University is to manage, develop and transfer the Intellectual Property (IP) developed within the research programs at ÖzÜ. This is achieved by by progressing and exploiting and all intellectual assets developed within research activity as well as implementing and promoting the appropriate mechanisms.

This catalog presents an overview of the ÖzÜ IP portfolio. Through partnerships and licensing agreements with industry, the patents ensure that ÖzÜ's investments in pioneering research find secondary purposes that benefit economy and improve quality of life.

Currently, ÖzÜ holds 45 patent applications, 3 utility model applications, and additional 6 country designations in national phase of a PCT application since 2013. ÖzÜ also has 3 national patent registrations, 2 US patent registrations and 2 German utility model registrations as of the first quarter of 2017. As presented in this catalog, ÖzÜ has a range of technologies available for licensing, including but not limited to nanotechnology, robotics, lighting technologies, bio-additives, information & communication technologies, biomedical technologies, construction materials, technologies for educational use and mechanical technologies.

We hope that you will find this catalog useful and take the opportunity to review technologies available for licensing at ÖzÜ.

We look forward to hearing from you and collaborating with you to make an impact together based on our academic innovation.

Sincerely,

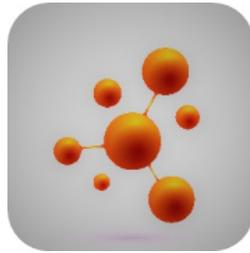
Nilay Papila, PhD

AVAILABLE TECHNOLOGIES FOR LICENSING

“ÖzÜ has different patent applications about the lots of technological areas since 2013. ÖzÜ’s patents are related with important inventions, especially in the fields of technology that are used in parallel with developing trends and innovation in the world. With in this scope, “commercialisation of technology” is an essential for extending the usage of precious technologies.”



Bio-Additives



Nanotechnology



Lighting
Technologies



Information &
Communication
Technology



Biomedical
Technologies



Construction
Materials



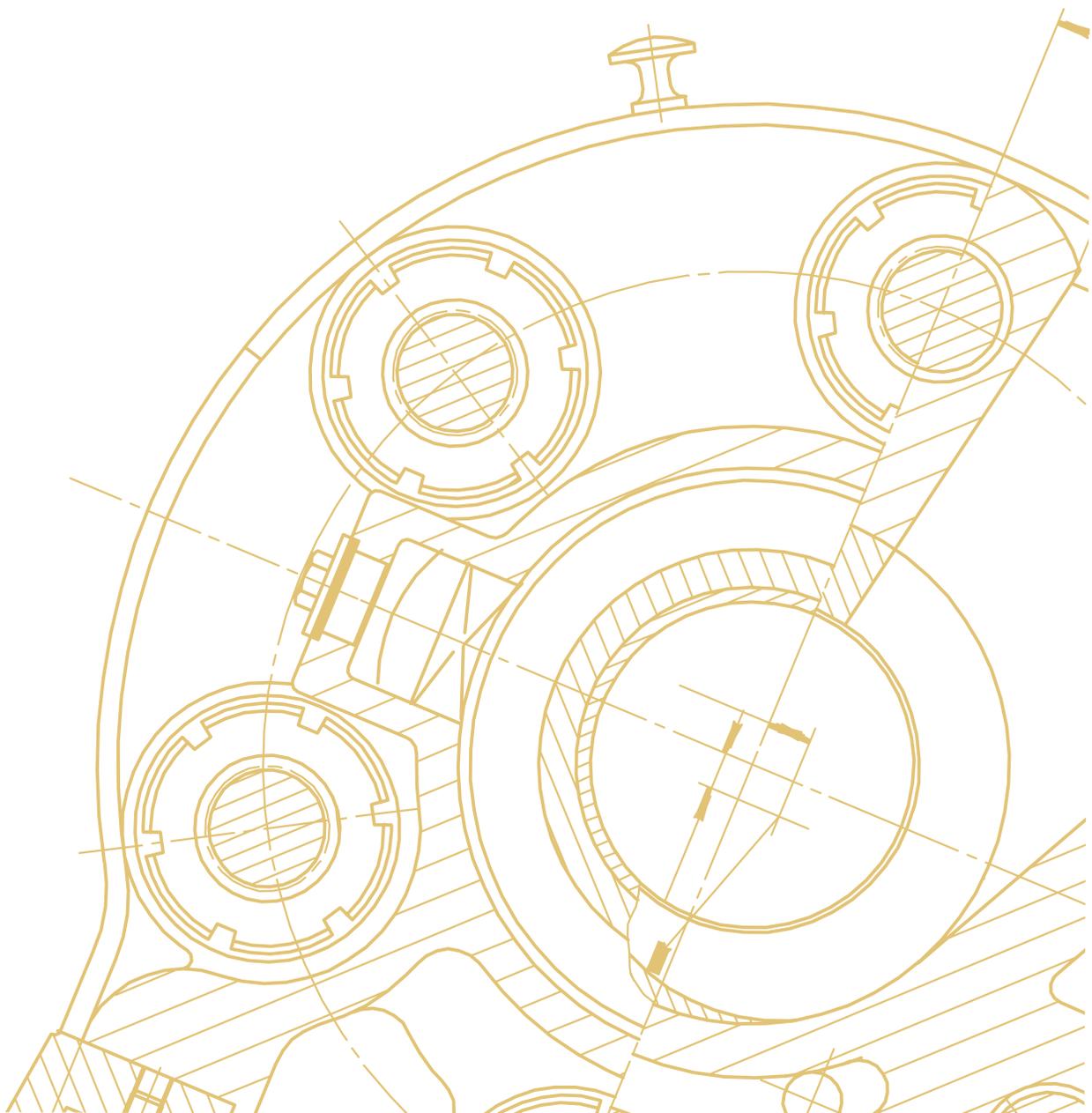
Mechanical
Technologies

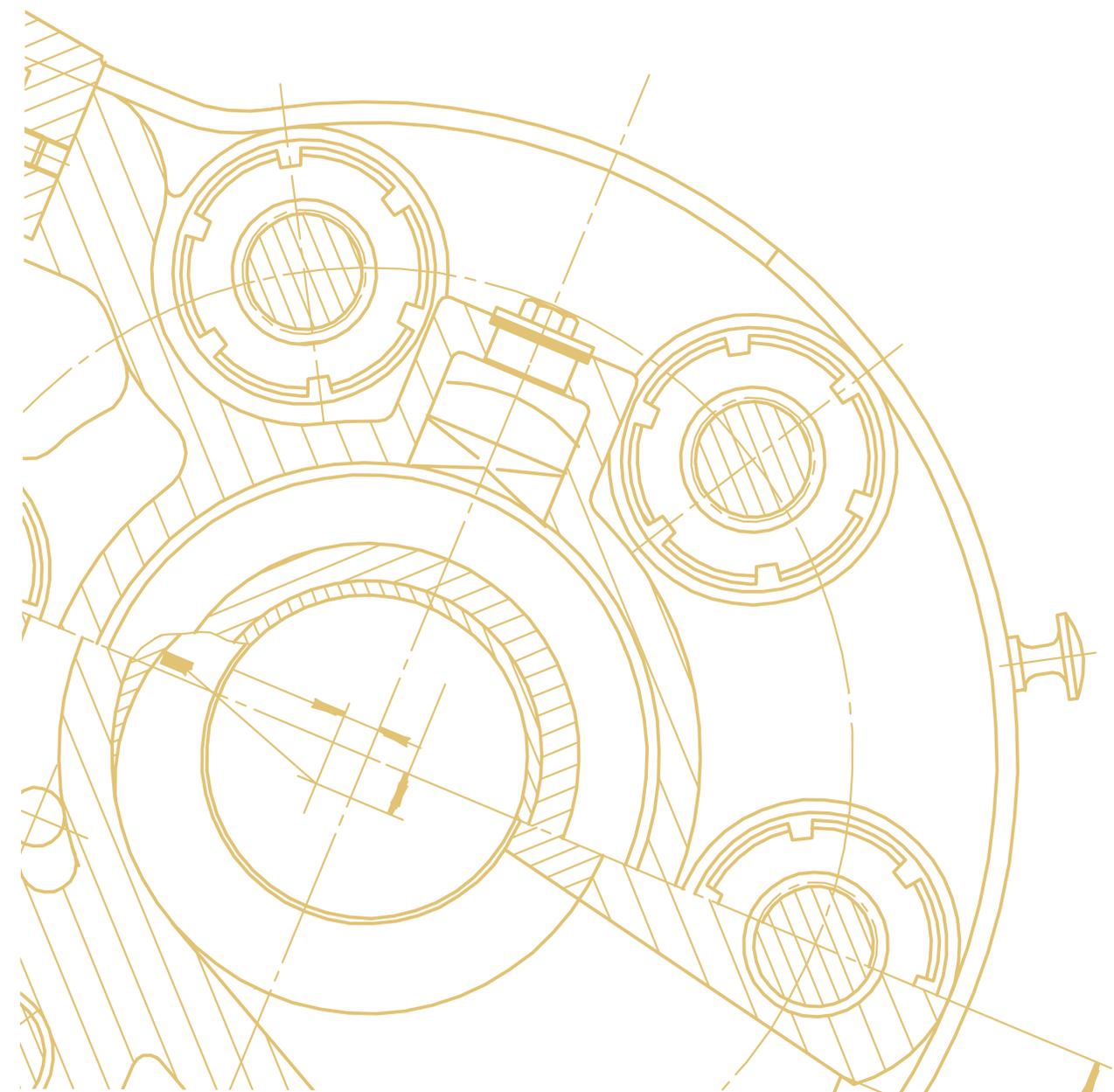


Technologies for
Educational Use

BIO ADDITIVES

“Food processing is one of the most interested technologies in the food industry, which is clarified as an application to transform raw plant into products such as freezing vegetables, colorants, dietary supplements. As a development study to novel extraction process of lycopene is come to light at ÖZÜ laboratories in 2015, some new extraction processes have been tried and achieved to success.”





PROCESS AND METHOD FOR OPTIMAL RECOVERY OF CAROTENOIDS FROM PLANTS

Potential Application Area(s)

Biochemistry
Food coloring

Patent Status

PCT/TR2016/050538
PCT/TR2015/050264

Inventor(s)

Assoc. Prof. Dr. G. Bahar Başım Doğan
Arısan İnce

Technology Readiness Level

TRL 7

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Problem:

There is a need to improve the available industrial processes for production of carotenoids from plants such as tomato, carrots or green vegetables with cost efficiency as well as extraction ability while protecting the extracts from degradation. Therefore, it is one of the aims in the present invention to provide an improved process and method for extracting carotenoid substance from plants that can be applied at the industrial scale economically as well as sufficient efficiency to obtain enhanced purity of the product with self-protection ability against heat and UV light.

Technology:

The present invention relates to a process for producing carotenoids, particularly lycopene, from plants or plant constituent parts, particularly from fruits and vegetables. The process comprising: providing a carotenoid source; providing an extraction solvent including at least one acetal compound and at least one component selected from medium chain fatty acids, water soluble primary alcohols and water soluble secondary alcohols; mixing the carotenoid source with the extraction solvent; extracting soluble components from the carotenoid source to produce carotenoid extract.



Advantages:

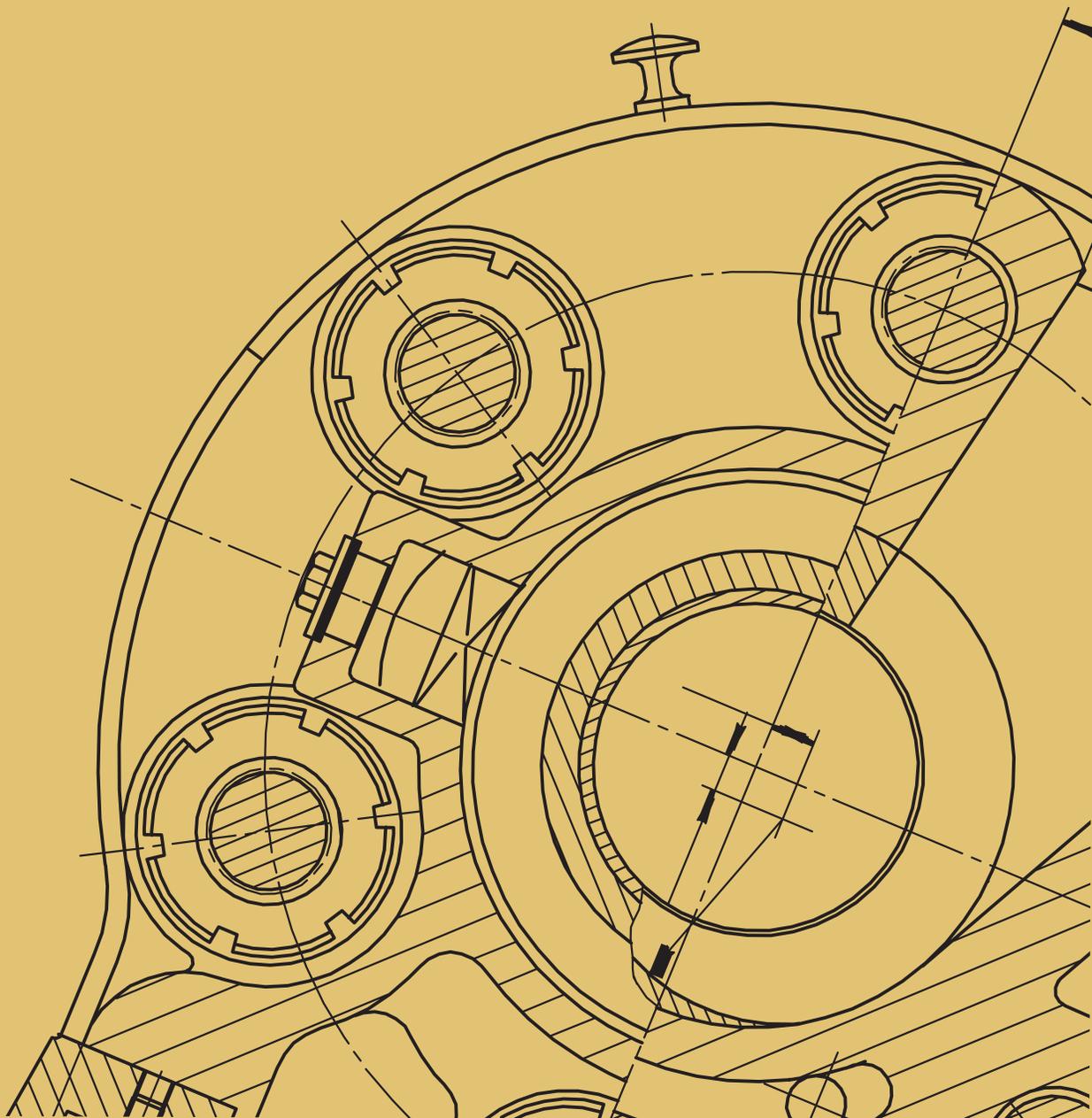
- Organic and pure extraction of lycopene
- Protection of the extracted lycopene from degradation in the organic solvent
- Shelf life improvement
- Recycling ability of the solvents used in the extraction systems

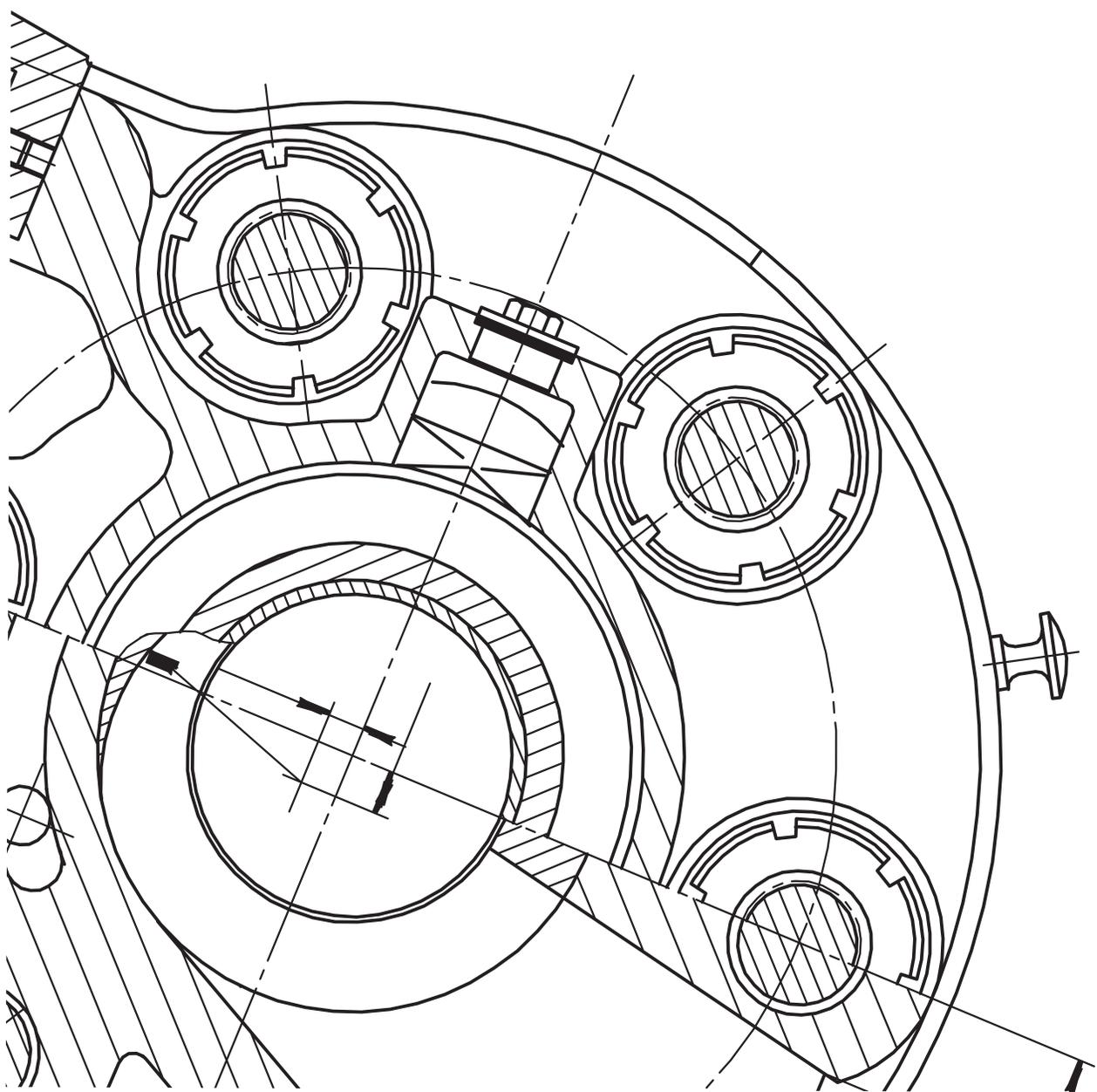
Related Articles:

- G.B. Basim, Z. Odemir, W. Akbar, and A. Cerhan, A. Ince, Synthesis and Novel Capsulation of Lycopene from Tomato Peel through Organic Methods. Proceedings of TechConnct Conference, 2017, Washington DC, Mat 2017 (forthcoming).

NANOTECHNOLOGY

“As a new technology trend that develops today, “nanotechnology” as defined by size is naturally very broad, including fields of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, microfabrication, molecular engineering and many other technical fields. Concordantly, ÖZÜ also conducts nanotechnology researches in its laboratories and also ÖZÜ researchers try to combine nano-scale chemical applications with robotic devices to create new, and useful technologies.”





NANO-BORON FOR TEXTILES

Potential Application Area(s)

Nanoparticle-coating for textile

Patent Status

PCT/TR2016/050169

Inventor(s)

Assoc. Prof. Dr. G.Bahar Başım Doğan

Technology Readiness Level

TRL 6

Contact

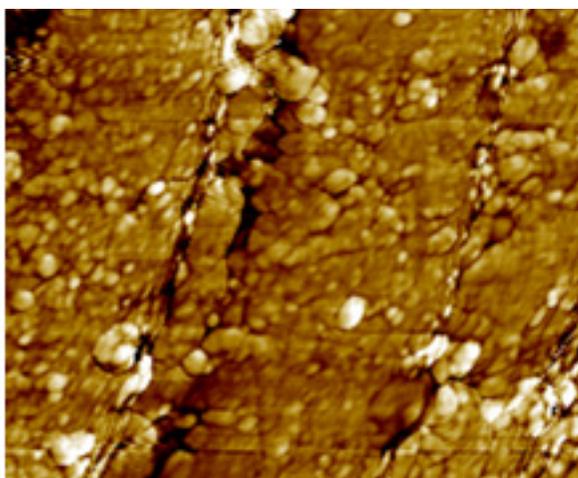
Assoc. Prof. Dr. Bahar Başım
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Problem:

Textiles have long been recognized as being prone to growth of microorganisms, such as bacteria and fungi. These microorganisms may exist in the environment even at unfavorable conditions and can quickly grow when the suitable moisture, nutrient and temperature conditions are available. The growth of microbes and bacteria on textiles during their use or storage not only degrades the performance of the textile itself but also negatively affects public health.

Technology:

The present technology of patent provides a novel and high performance textile functional coating composed of nanoparticles of boron (including in some embodiments substantially pure boron alone or a combination of substantially pure boron and boron compounds, such as boron oxides, nitrides, carbonates, and/or the like), which is referred to hereinafter as "nano-boron". The textile coating of the present disclosure eliminates or reduces the above-mentioned shortcomings of prior textile coatings and provides an enhanced antimicrobial and/or photocatalytic activity or property, which enables improved bacterial/fungal and stain resistance.



Advantages:

- The nano-boron textile coating and process for preparing the textile coating as disclosed in the patent have resulted in a textile coating that enhances resistance to bacterial or fungal growth
- With the addition of nano-boron as a dopant photocatalyst, the nano-boron textile coating further enhances resistance to both bacteria or fungi growth and helps remove stain formation

Related Articles:

- Basim G.B., Akbar, W., Karagoz, A., Aktas, G. "Stimulation Free Antibacterial Functionality Evaluation of Nano-boron Coated Textiles", Electrically Active Materials for Medical Devices, Chapter 25, ISBN: 978-1-78326-986-0.
- Akbar, W., A., Noor, M., Kowal, K., Syed, T., Basim, G.B. "Characterization and anti-bacterial properties of nanoboron powders and nanoboron powder coated textiles" Advanced Powder Technology, 159, P 102-111, 2017.

NANOSTRUCTURE OF CHEMICAL MECHANICAL POLISHING INDUCED LIVE NANO-STRUCTURES FOR LIME-SCALE PREVENTING ON HEATING ELEMENTS

Potential Application Area(s)

Chemical mechanical polishing nanostructures

Patent Status

US14/913,317
EP13838090.2
CN201380079019.3
PCT/TR2013/000378
TR2013/09981

Inventor(s)

Assoc. Prof. Dr. G.Bahar
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Technology Readiness Level

TRL 6

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Problem:

The heating elements used to heat liquids generally operate in direct contact with the liquid environment, which is typically water with ionic contents such as calcium and magnesium. The resulting lime-scale prevents the heat exchange from the heating element through the liquid by significantly thickening over the time and significantly reduces the operating efficiency.

Technology:

The present invention relates to the heating elements used inside a liquid (particularly water) for the purpose of heating the liquid and invention predominantly focuses on a heating element operating in contact with a liquid and comprising of Chemical Mechanical Polishing induced nanostructures which are capable of constantly preventing lime scale build-up at the liquid/heating element interface.



Advantages:

- A heating element capable of continuously and actively preventing lime-scale build up
- Reduction of lime-scale formation without the need of an additional coating material
- Affordable process with corrosion prevention ability

Related Articles:

- Karagoz, A., Craciun, V., Basim, G.B., "Characterization of Nano-Scale Protective Oxide Films_ Application on Metal Chemical Mechanical Planarization". ECS Journal of Solid State Science and Technology, 4 (2) P1-P8, 2015.
- Basim, G.B., Karagoz, A., Ozdemir Z., "Metal Oxide Nano Film Characterization for CMP Optimization", Proceedings of ECS Fall Meeting, Honolulu, Hawaii, October 2012.
- Basim, G.B., Karagoz, A., Ozdemir Z., "Advanced slurry Formulations for New Generation Chemical Mechanical Planarization (CMP) Applications" Proceedings of MRS Spring Meeting, San Francisco, CA, April 2012.

THE METHOD OF PROCESSING DENTAL IMPLANTS USING CHEMICAL AND MECHANICAL NANO TEXTURING



Potential Application Area(s)

Chemical Mechanical Polishing

Patent Status

TR2013/15577
PCT/TR2014/000530

Inventor(s)

Assoc. Prof. Dr. Gül Bahar Başım
Asst. Prof. Dr. Özkan Bebek
Sabri Orçun Orhan
Zeynep Özdemir

Technology Readiness Level

TRL 6

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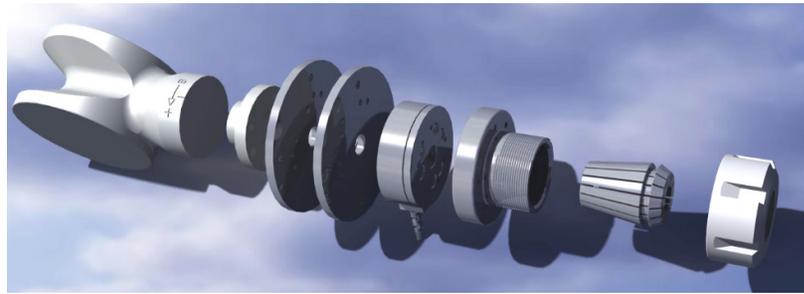
Assist Prof. Dr. Özkan Bebek
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Problem:

Although titanium implants are applied with a high success today, bone-to-implant connection problems occurring in some patients in the early period (fibrous non-union and infection) may lead to loss of the implant. Another important issue of implantology is the long waiting period for the bone-implant connection after the surgery. In addition, titanium implants do not have periodontal tissues like teeth, so they have low resistance against external influences in the mouth. Eliminating these inefficiencies is the basis of research for titanium-based implants in recent years. In order to provide optimum and long-term resistant bone-implant connection, the main goal is to create the appropriate surface. While provoking the rapid migration of bone cells and production of extracellular matrix, the production of bio-surface that performs pathogen leak-proof interconnection with bone and soft tissue is required in long-term.

Technology:

The present invention comprises of development of a new generation dental bio-implant via CMP process, which helps surface modification through formation of protective oxide layers while spontaneously inducing surface nano-structuring. In addition, the process is brought up to a 3-D polishing ability by means of robotic aided control system.



Advantages:

- Ability of engineered bio-implant surface generation through spontaneous nano-structuring and self-protective surface layer ability
- High potential of controlled bio-activity tunable for promoted/demoted cell attachment
- High Volume manufacturability with low price through advanced robotics controlled 3-D CMP process development

Related Articles:

- Z. Ozdemir, O. Orhan, O. Bebek, and G. B. Basim, "Development of 3-D Chemical Mechanical Polishing Process for Nanostructuring of Bioimplant Surfaces," ECS Transactions, vol: 61, no: 17, pp. 21-26, 2014, doi: 10.1149/06117.0021ecst.
- Z. Ozdemir, O. Orhan, O. Bebek, and B. Başım, "Development of 3-D Chemical Mechanical Polishing Process for Nanostructuring of Bioimplant Surfaces", 225th ECS Meeting, May 11-16, 2014, Orlando, FL, MA2014-01(38), pp. 1430

THE METHOD OF PROCESSING MULTIDIMENSIONAL OBJECTS USING CHEMICAL AND MECHANICAL POLISHING

Potential Application Area(s)

Resistances of Washing Machine
Dishwasher Teapot
Central Heating Boiler

Patent Status

PCT/TR2014/000530
TR 2014/03879

Inventor(s)

Assoc. Prof. Dr. Gül Bahar Başım
Asst. Prof. Dr. Özkan Bebek
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Technology Readiness Level

TRL 5-6

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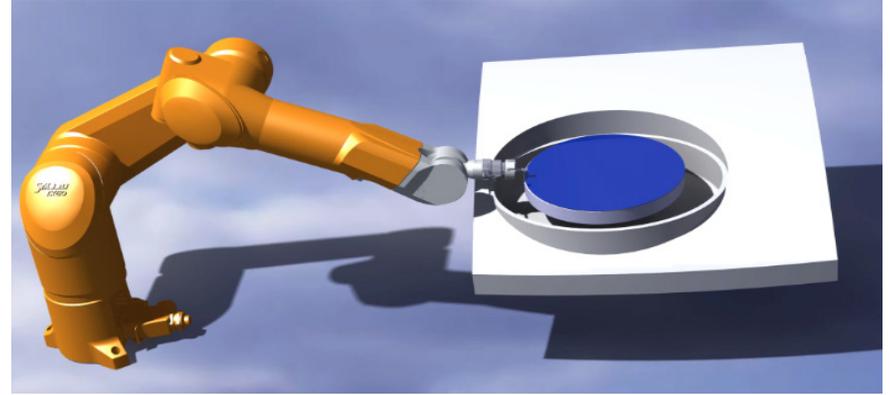
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Problem:

In the machines, which are sub served for heating liquids, resistances are used as a heating element. Those resistances operate in direct contact with the liquids. In general, the roughness of resistances' surfaces is formless. As a result, lime-scale is built up over time in an uncontrolled manner. Additionally, current technology could be applied to only 2-dimensional plates.

Technology:

The present invention provides a process that develops nanostructures by using CMP technique on the multidimensional and formless objects such as resistances. With the aid of CMP, roughness of the metal material will be adjusted by processing its surface chemically and mechanically. Moreover, in the robotic arm configuration, which is the subject of the invention, has industrial serial kinematics configuration with 6 degrees of freedom. This industrial robot arm ensures access to any point from any angle in 3 dimensional spaces.



Advantages:

- To prevent lime-scale buildup of metal surfaces
- To eliminate using additional material (generally chemical) to prevent lime-scale buildup
- To ensure to access any point of a multidimensional object due to the robotic arm

Related Articles:

N/A

THE METHOD OF PROCESSING MULTIDIMENSIONAL OBJECTS AND LARGE AND CURVED SURFACES USING CHEMICAL AND MECHANICAL NANO TEXTURING



Potential Application Area(s)

Automotive and Airplane Industry

Patent Status

TR2014/03476

PCT/TR2014/000530

EP14841416.2

Inventor(s)

Assoc. Prof. Dr. G. Bahar

Başım Doğan

Assist Prof. Dr. Özkan Bebek

Zeynep Özdemir

Sabri Orçun Orhan

Technology Readiness Level

TRL 4

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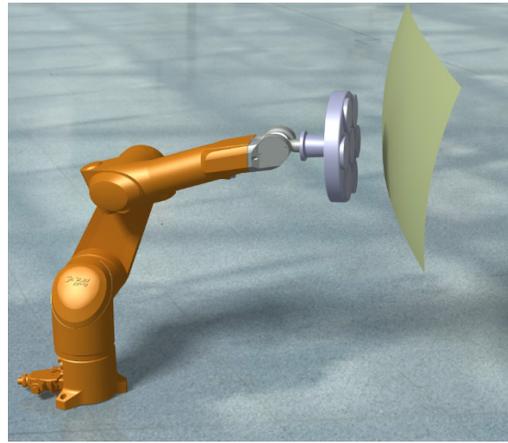
+9 0216 564 93 96

Problem:

There is different ruggedness on the surface of metal materials by changing the pads and chemicals used in the methods known in the art which allow for chemical and mechanical double actuation at nano size.

Technology:

The technology which is disclosed in this patent, a method employed for improving two-dimensional CMP/Chemical Mechanical Polishing device and smoothing/polishing process and process of texturing multidimensional objects (such as heating elements-resistors, dental implants) in 3-D and configuration of the robotic arm employed in this method, as used for smoothing wide and irregular surfaces.



Advantages:

- Both mechanical and chemical nano texturing applicable
- Fast and efficient method
- Minimize the deterioration of the surface by environmental factors
- Extending the paint life of the material during the repair of painted surfaces

Related Articles:

N/A

the \mathbb{R}^n is a linear space over \mathbb{R} with the usual addition and scalar multiplication. The inner product is defined by

$$(x, y) = \sum_{i=1}^n x_i y_i \quad (1)$$

where $x = (x_1, \dots, x_n)$ and $y = (y_1, \dots, y_n)$ are vectors in \mathbb{R}^n .

The norm of a vector x is defined by

$$\|x\| = \sqrt{(x, x)} = \sqrt{\sum_{i=1}^n x_i^2} \quad (2)$$

The distance between two vectors x and y is defined by

$$d(x, y) = \|x - y\| = \sqrt{\sum_{i=1}^n (x_i - y_i)^2} \quad (3)$$

The angle between two vectors x and y is defined by

$$\cos \theta = \frac{(x, y)}{\|x\| \|y\|} \quad (4)$$

The orthogonal projection of a vector x onto a vector y is defined by

$$p_y(x) = \frac{(x, y)}{(y, y)} y \quad (5)$$

The orthogonal complement of a subspace W is defined by

$$W^\perp = \{x \in \mathbb{R}^n \mid (x, y) = 0 \text{ for all } y \in W\} \quad (6)$$

The orthogonal decomposition of a vector x into a vector in W and a vector in W^\perp is defined by

$$x = p_W(x) + (x - p_W(x)) \quad (7)$$

The orthogonal distance from a vector x to a subspace W is defined by

$$d(x, W) = \|x - p_W(x)\| \quad (8)$$

The orthogonal distance from a vector x to a vector y is defined by

$$d(x, y) = \|x - p_y(x)\| \quad (9)$$

The orthogonal distance from a vector x to a line L is defined by

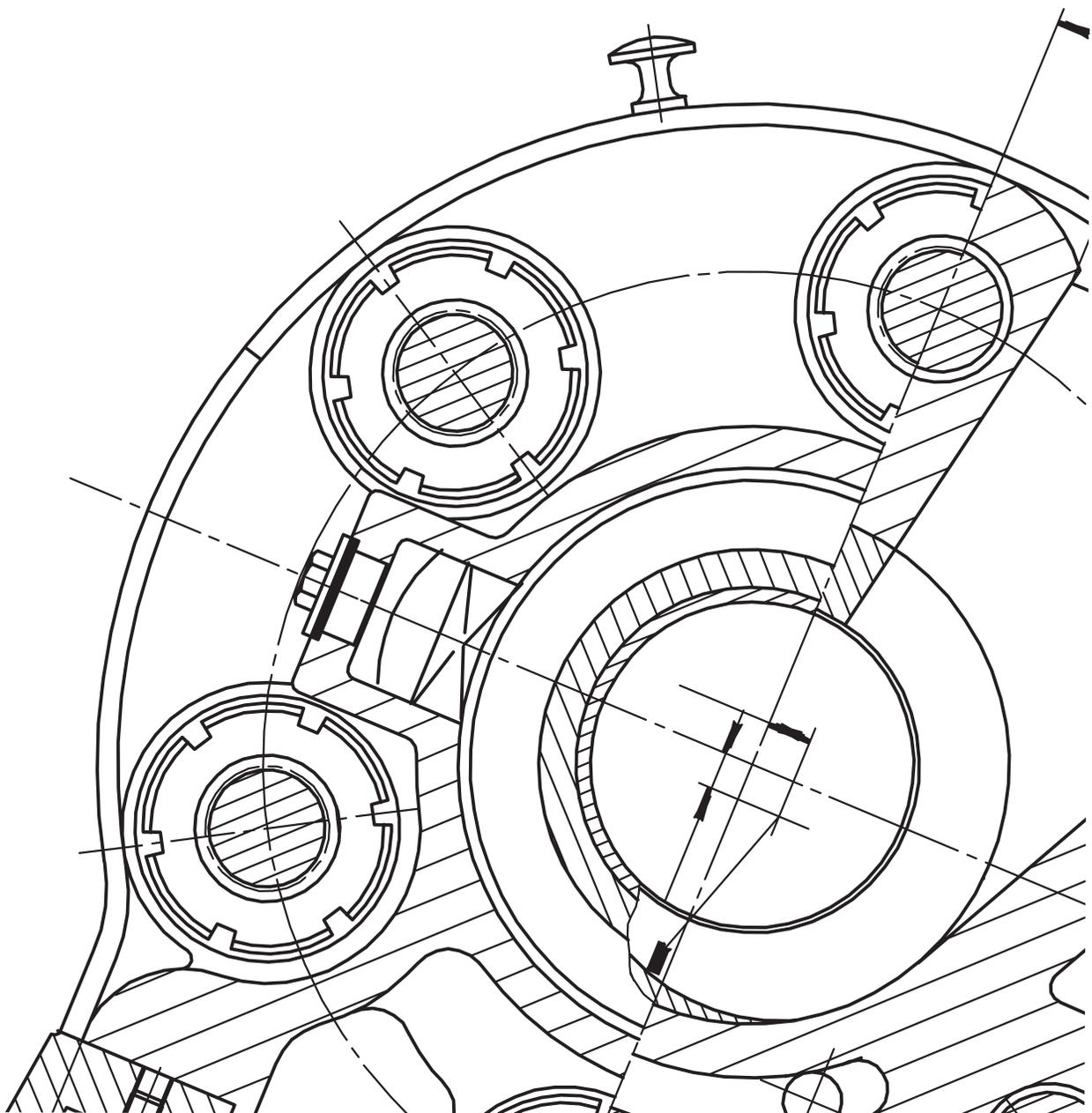
$$d(x, L) = \|x - p_L(x)\| \quad (10)$$

The orthogonal distance from a vector x to a plane P is defined by

$$d(x, P) = \|x - p_P(x)\| \quad (11)$$

LIGHTING TECHNOLOGIES

“One of the most popular and leading research area is “lighting technologies” without question. ÖzÜ filed several patent applications in relation to LED and other lighting technologies from bio-compatible lighting technology to high efficient cooling systems, and from passive infra-red sensor systems to optothermal LED lighting.”



FLOW COOLED SOLID STATE LIGHTING WITH PREFERRED OPTICAL AND ADVANCED SENSING FEATURES

Potential Application Area(s)

Lighting Technology

Patent Status

PCT/TR2016/050298

Inventor(s)

Prof. Dr. Mehmet Arik

Technology Readiness Level

TRL 7

Contact

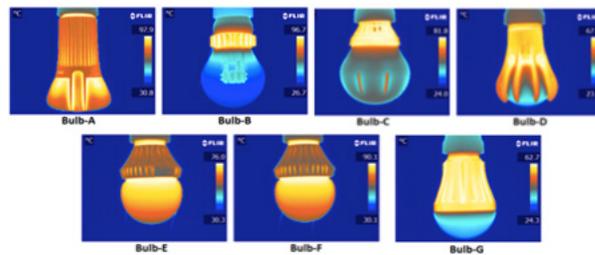
Prof. Dr. Mehmet Arik
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Problem:

Prior LED lamps and heat sinks have not had sufficient capacity that allow for high luminous flux and that perform the cooling required for LED lamps generating high heat.

Technology:

The present invention addresses some problems by providing a highly efficient lighting apparatus and controlled lighting system and method that enables air to efficiently flow and perform the cooling process, and in particular to perform the cooling process for the LEDs, phosphor, and the driver circuit. The lighting apparatus, system, and method can be combined with the preferred optical features and sensing, data collection and data sharing features.



Advantages:

- Highly efficient manner for increased lumen extraction and cooling efficiency while maintaining weight and size constraints of a bulb.
- Lighting apparatus of the present invention is thermally and optically optimized
- Sound and/or motion sensors, humidity and temperature sensors can be integrated

Related Articles:

- Inan M. N., Arik M., "A multi-functional design approach and proposed figure of merits for solid state lighting systems", Journal of Solid State Lighting 2014:8 DOI: 10.1186/2196-1107-1-8© Inan and Arik; licensee Springer, 2014

LIGHTING INTERLAYERS FOR OPTICAL PATHS OF LIGHT EMITTING OR ABSORBING SYSTEMS

Potential Application Area(s)

Lighting Technology

Patent Status

PCT/TR2016/050517

TR2015/16627

Inventor(s)

Prof. Dr. Mehmet Arik
Assoc. Prof. Dr. Sedat Nizamoglu

Technology Readiness Level

TRL 3

Contact

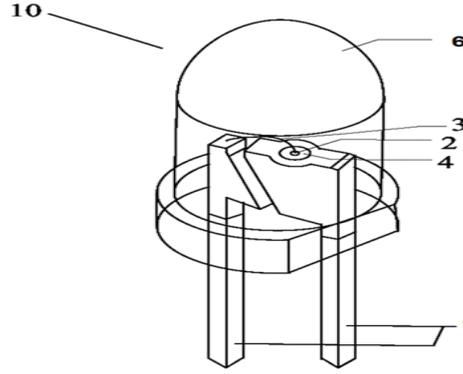
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Problem:

Various different coating constructs or lens based systems are used with a view to enhancing the luminous efficacy of LEDs. Said coating constructs are commonly epoxy materials. Epoxy and silicon materials available in optical paths of LEDs have a low thermal performance.

Technology:

Present technology provides lighting systems emitting or absorbing light, and containing at least one radiation layer which is located along the optical path of light with or without phosphor, and makes radiation by absorbing light and contains silk fibroin, and is capable of controlling the light distribution.



Advantages:

- Increasing illuminating capacity of LEDs
- Keeping the heating occurring in LED during illumination below the average heating values
- Obtaining a non-synthetic lighting interlayer that is recyclable in nature

Related Articles:

- S. U. Yuruker, M. Arik, E. Tamdogan, R. Melikov, S. Nizamoglu, and I. Durak, "Thermal and optical performance of eco-friendly silk fibroin proteins as a cavity encapsulation over LED systems", ASME Interpack 2015, San Francisco, USA, July 2015.

LIGHT ENGINE SYSTEM PREFERRED IN LED-BASED LIGHTING SYSTEMS

Potential Application Area(s)

LED based Lighting System

Patent Status

PCT/TR2016/050426

TR2015/14689

Inventor(s)

Prof. Dr. Mehmet Arik
Ferina Saati

Technology Readiness Level

TRL 3

Contact

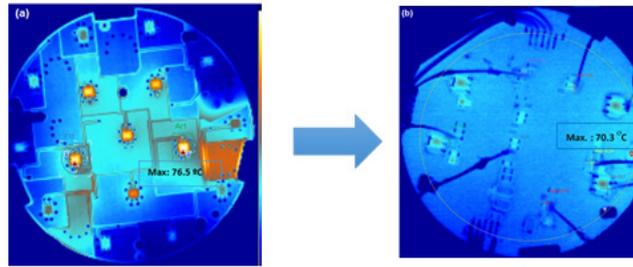
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Problem:

In the background of technology various type of PCBs structures are used to allow the use of multifunctional LEDs (light emitting diodes) in automotive industry applications. These examples have a common basic property, characterized in that they are related to apparatuses having only LED structures on PCB and having heat sinks or similar cooling apparatuses on the other side. Extra cooling designs developed for limited spaces, providing specific solutions with regard to automotive applications are needed.

Technology:

The technology relates to cooling units developed in LED applications in automotive industry and it also uses advanced printed circuit board technologies that minimizes the heat resistance and renders heat conductivity more efficient and productive compared to standard printed circuit boards.



Advantages:

- Eliminating local hotspots on the PCB
- Enabling dissipation of heat generated in PCBs over the board
- Creating a structure preventing the heating of PCB boards
- Extending useful operating life.

Related Articles:

- F. S. Khosroshahi, M. Arik, C. S. Tufekci, "A computational and experimental study on a harsh environment LED system for vehicle exterior lighting applications", IOTHERM 2014, Orlando, June 2014.

HEAT SINK COOLING WITH MOUNTED SYNTHETIC JET DEVICES SYSTEMS

Potential Application Area(s)

Electronics Cooling
Lighting
LEDs
HVAC systems
Chillers

Patent Status

PCT/TR2015/050241
USN15/511175

Inventor(s)

Prof. Dr. Mehmet Arik
Muhammad Ikhlaz

Technology Readiness Level

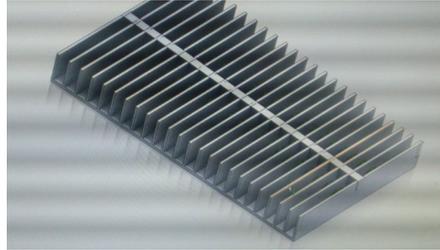
TRL 3-4

Contact

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Problem:

Heat sinks are the passive cooling components used for removing the heat released by the electronic devices. In the systems where active cooling is used, the actively cooled heat sink with fans decreases the reliability of the system and causes extra energy loss. Utilization of novel cooling systems with low power consumption and high lifetime is critical for sustainable thermal management applications.



Advantages:

- To cool down the LED chips and other electronic circuit members as the driver in a multi-purpose manner
- Reaching high performance cooling
- Reducing heat sink size and weight
- Cause drastic cost reduction
- Increasing lifetime

Related Articles:

- N/A



FLUORESCENT PROTEIN INTEGRATED LIGHT EMITTING DIODES

Potential Application Area(s)

Lighting
LEDs

Patent Status

TR2013/15075

Inventor(s)

Asst. Prof. Dr. Sedat Nizamoglu

Technology Readiness Level

TRL 6

Contact

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Problem:

Bio-friendly, energy efficient and high-color quality solid-state lighting is required due to the current limitations of phosphor-based LED technology and the currently investigated nanocrystal-integrated LED technology.

Technology:

We propose a new class of color-conversion LEDs integrated with fluorescent proteins to overcome the disadvantages of currently used and investigated color conversion materials.

Advantages:

- Efficient and stable white light generation by strong absorption, high fluorescence quantum yields and high photostability
- The custom-designed emission spectrum by the narrow-emission linewidth of fluorescent proteins
- Biocompatible characteristics (green lighting)

Related Articles:

- S. Nizamoglu, M. C. Gather, and S. H. Yun, "All-biomaterial laser using vitamin and biopolymers," *Advanced Materials* 25, 5943-5947 (2013).

A LIGHTENING SYSTEM THAT ADJUSTS LIGHTING DURATION AND DENSITY

Potential Application Area(s)

Lighting

Patent Status

TR2014/08817

Inventor(s)

Asst. Prof. Dr. Özkan Bebek
Sabri Orçun Orhan

Technology Readiness Level

TRL 5

Contact

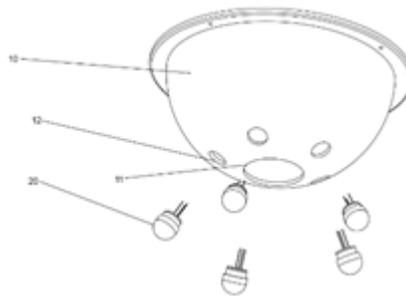
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Problem:

Current technology provides automatic lighting systems that recognize one's movement. However, in these systems lighting sensors are programmed to remain open for a determined period of time, and it switches off itself even if the person is still present and needs light. Sometimes, sensors are programmed to remain for a long time to prevent this problem; however, it causes decrease in energy efficiency. There are different types of sensitive sensors such as single or multicolor infrared camera systems, laser scanning systems, or ultrasonic systems. Nevertheless, all of these systems have drawbacks as high costs, technical difficulties or sizableness.

Technology:

The invention is comprised of Passive Infra-Red (PIR) sensor, which is the most suitable system for automatic lighting. The PIR sensor array not only detects the movements, but also perceives the presence of a person.



Advantages:

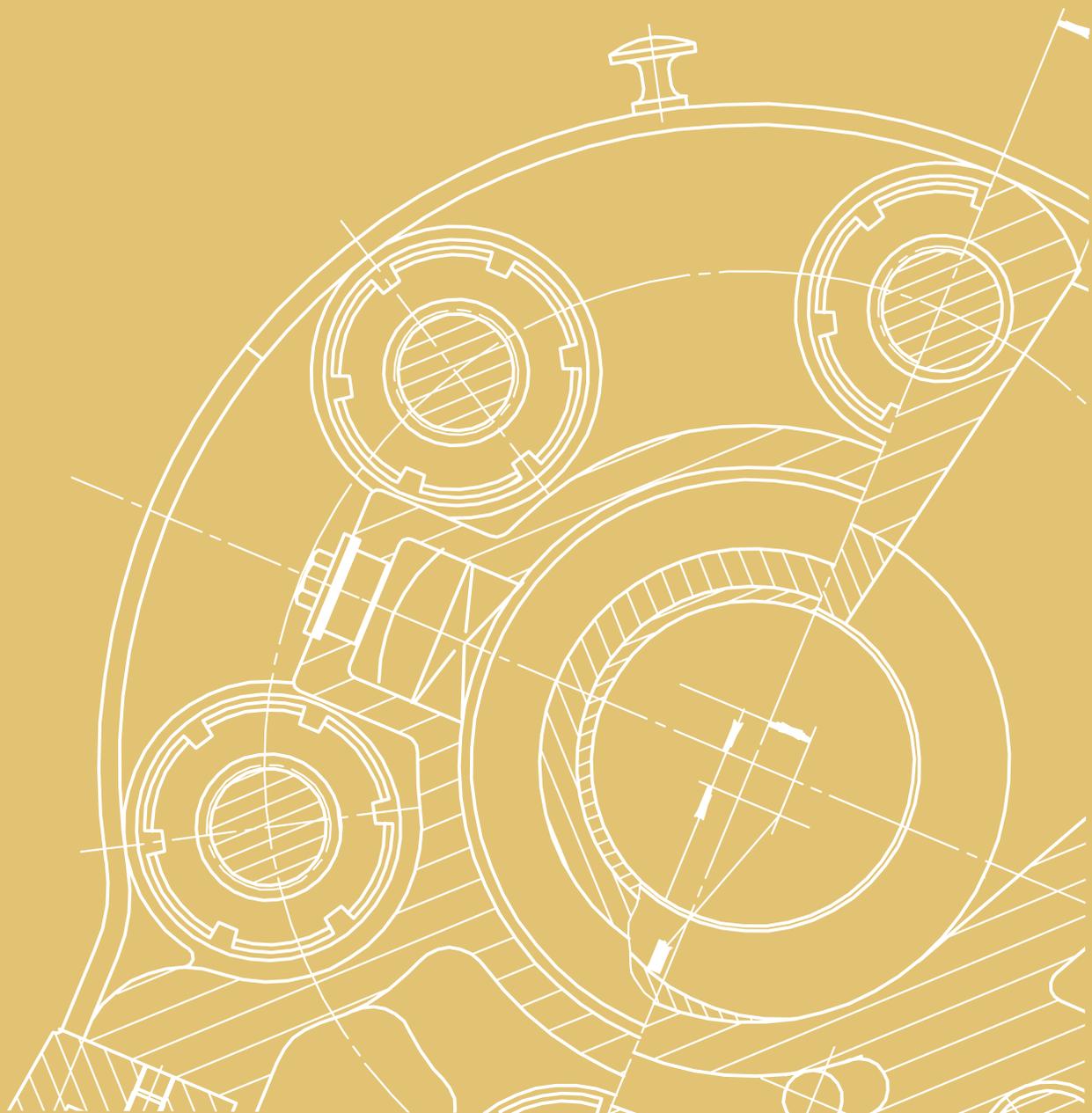
- To provide energy efficiency
- Easy integration to the LED light bulbs due to the small size of the sensor
- Low-cost

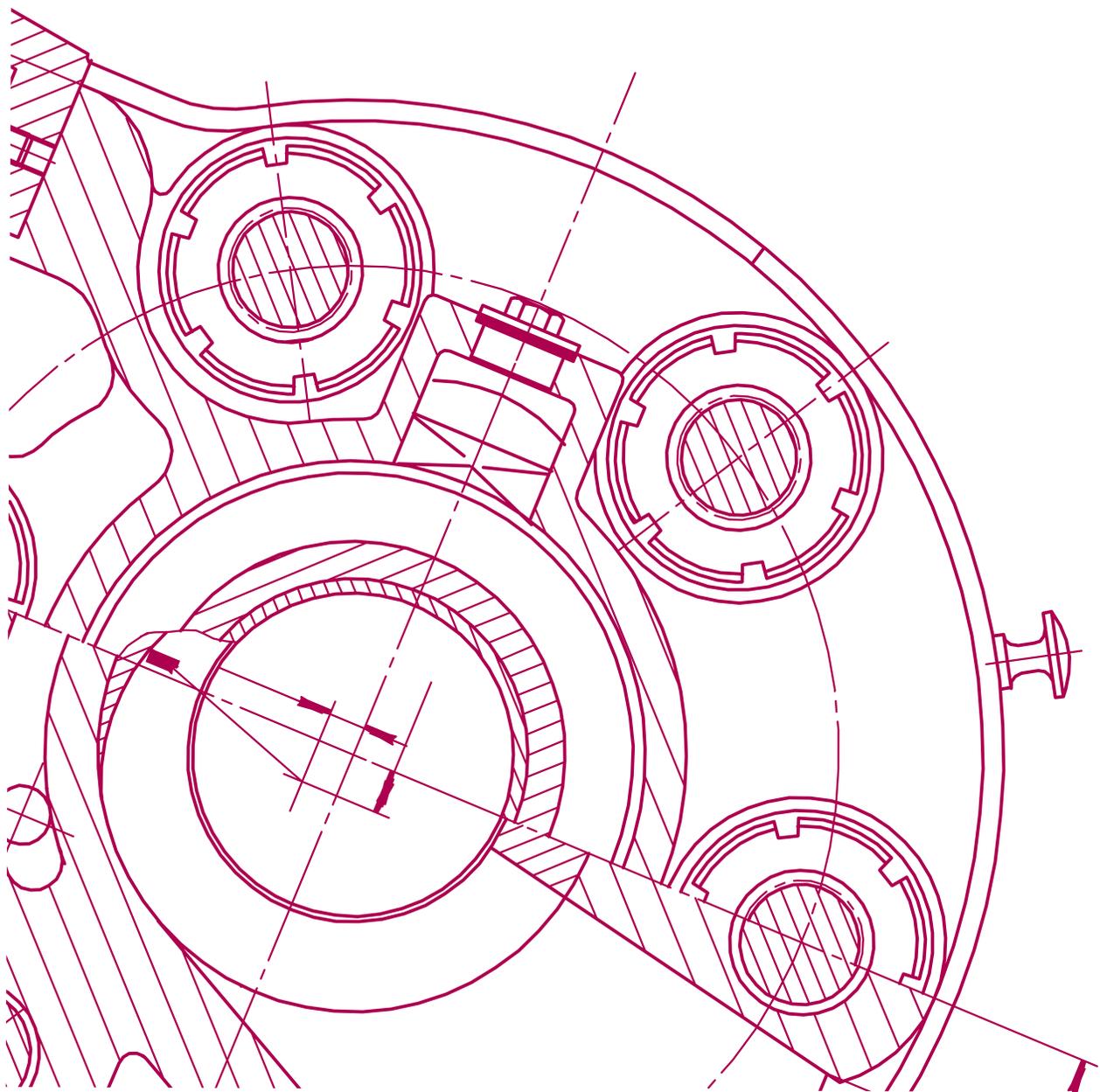
Related Articles:

- O. Bebek, M. Kaya, and S. O. Orhan, "Developing next generation LED Lamps: Discriminating and identifying human movements", SSL-TR 2013: International Workshop on Solid State Lighting Technologies and Research: LEDs and OLEDs, August 20-21, 2014, pp. 45.

INFORMATION & COMMUNICATION TECHNOLOGIES

“No one can imagine a world without the internet, wireless networks, and cell phones... In recent years, information and communication technologies have provided society with a wide array of new communication capabilities, to which ÖZÜ also would like to contribute. In this sense, within 2016, ÖZÜ applied four patent applications, one is about Random Network Coding, one is about Visible Light Communications, one is about Communication Between Vehicles and the other one is about Failure Protection for Multi topology Networks”





RANDOM NETWORK CODING IN ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS (OFDMA) NETWORKS USING CONTROL SIGNALING



Potential Application Area(s)

Wireless
Communication Networks
Internet of Things

Patent Status

PCT/TR2016/050410
TR2015/14750

Inventor(s)

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İbrahim Altunbaş
Semiha Tedik
Güneş Karabulut

Technology Readiness Level

TRL 3

Contact

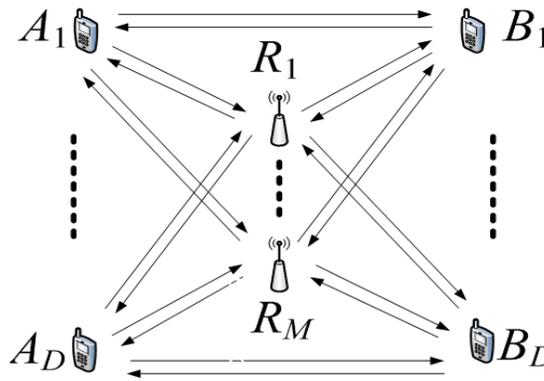
Prof. Dr. Murat Uysal
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Problem:

Rapidly increasing mobile traffic has become a serious concern for current wireless networks. It is predicted that there will be 50 billion connected devices by 2020. Enabling communication among these devices with limited radio resources, major structural changes are expected to take place in next generation Internet. In conventional wireless networks, functionalities such as routing, error control coding and data storage are designed in accordance with the principle of network nodes performing transmission independently. Unconventional approaches in network design are required to deal with the ever-increasing demand for wireless applications and services.

Technology:

The present invention is a multi-carrier and multi-way random network coded cooperative communication system. Through the deployment of relay nodes, efficient resource utilization mechanisms are devised for scalable wireless networks with randomly changing topologies.



Advantages:

- Enabling cooperative communications
- Enhancing coverage area
- Reducing the total transmit power
- Improving outage performance

Related Articles:

- Heidarpour, G. Karabulut Kurt, and M. Uysal, "Finite-SNR Diversity-Multiplexing Tradeoff for Network Coded Cooperative OFDMA Systems" IEEE Transactions on Wireless Communications, vol.16, no.3, March 2017.
- S. Tedik Basaran, G. Karabulut Kurt, M. Uysal, and I. Altunbas, "A Tutorial on Cooperative Network Coding," in Communications Surveys and Tutorials, vol.18, no.4, 2016.

COMMUNICATION BETWEEN VEHICLES OF A PLATON

Potential Application Area(s)

Commercial
Civilian and Military Platoon Communications

Patent Status

PCT/TR2015/050266
US 14902235

Inventor(s)

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Assoc. Prof. Dr. Serhat Erküçük
Ömer Narmanlıoğlu

Technology Readiness Level

TRL 3

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Problem:

Platoon formation of vehicles is a critical foundation for autonomous or semi-autonomous vehicle control improving road safety, traffic flow, and environmental concerns towards the realization of intelligent transportation systems. Radio frequency (RF) wireless technologies are typically used to enable vehicle-to-vehicle communications. The main problem in using RF based communications in a vehicular platoon is that the communication between vehicles may be distorted by intentional RF jamming or could be intercepted by third parties, resulting in lack of reliability and security.

Technology:

The objective of the proposed invention is to provide a secure and reliable transmission between consecutive and non-consecutive vehicles in a platoon system through the use of visible light communication (VLC) technology. VLC is based on the idea of modulating light emitting diodes (LEDs) at very high speeds which are not noticeable to the human eye. Through this technology, vehicles fitted with LED-based front and back lights can communicate with each other in an inherently secure way. VLC is however mainly limited to communication between consecutive vehicles and does not provide an easy method of communication between any non-consecutive or multiple vehicles in a platoon. To address this problem, this invention proposes a reliable multi-hop VLC communication based on token-based data transmission, in addition to determining the position of each vehicle in the platoon without any prior information.



Advantages:

- Secure and reliable data communications within a vehicular platoon
- Determining vehicle positions without the need of an external system such as a GPS
- System based on low-cost and energy-efficient VLC technology

Related Articles:

- N/A

ADAPTIVE MULTIPLE INPUT MULTIPLE OUTPUT (MIMO) OPTICAL ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (O-OFDM) BASED VISIBLE LIGHT COMMUNICATION

Potential Application Area(s)

Communication Technology

Patent Status

US15/398197

US62/276091

Inventor(s)

Prof. Dr. Murat Uysal
 Asst. Prof. Dr.R. Çağlar Kızılırmak
 Asst.Prof.Dr.Tuncer Baykaş
 Ömer Narmanlıoğlu

Technology Readiness Level

TRL 3

Contact

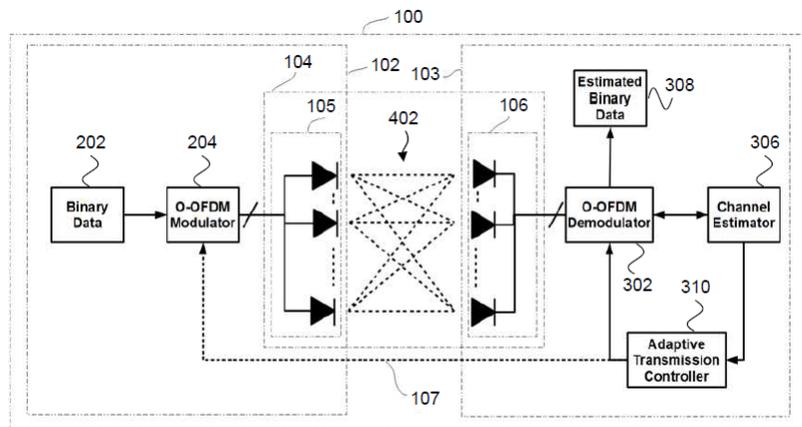
Prof. Dr. Murat Uysal
 murat.uysal@ozyegin.edu.tr
 +9 0216 5649329

Problem:

Visible light communication (VLC) is a short range optical wireless data transmission method that uses the illumination infrastructure as wireless access points. In indoor environments, the channel conditions and achievable signal-to-noise ratio is highly dependent on the user location. This requires the development of adaptive physical layer technologies tailored for VLC systems that automatically adjust transmission parameters according to channel conditions.

Technology:

This invention presents a new method and system for adaptive VLC where several transmission parameters such as modulation size/order, type and configuration of multi-input multi-output (MIMO) communication techniques are optimally adjusted according to channel conditions. This invention will significantly enhance VLC system performance in terms of link reliability and data rate.



Advantages:

- Adaptively choosing transmission parameters according to channel conditions
- Improved link reliability
- Increased data rate

Related Articles:

- M. Uysal, F. Miramirkhani, O. Narmanlioglu, T. Baykas, and E. Panayirci, "IEEE 802.15.7r1 Reference Channel Models for Visible Light Communications", IEEE Communications Magazine, vol. 55, no. 1, p. 212-217, January 2017.

FAILURE PROTECTION FOR SOFTWARE DEFINED NETWORKS USING MULTI-TOPOLOGY ROUTING BASED FAST REROUTE

Potential Application Area(s)

Software information systems

Patent Status

US15/392794

Inventor(s)

Asst. Prof. Dr. Selçuk Cevher

Technology Readiness Level

TRL 4- 5

Contact

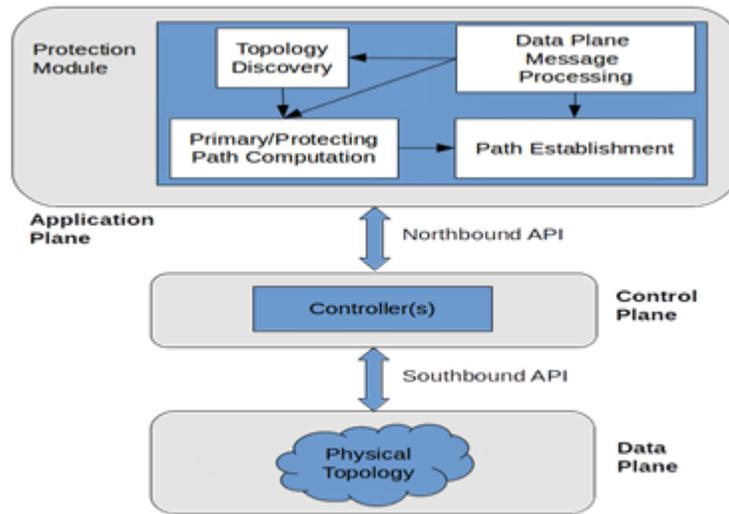
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Problem:

The data traffic being transmitted in the forwarding plane of software defined networks (SDN) may be disrupted due to the unexpected link/switch failures or planned maintenance tasks. The fast recovery from the network failures in the forwarding plane plays a crucial role in supporting the real-time services in SDN.

Technology:

Within the scope of invention, a software defined networking (SDN) controller and methods based on multi topology routing for protecting against failure of a network element in a forwarding plane are provided.



Advantages:

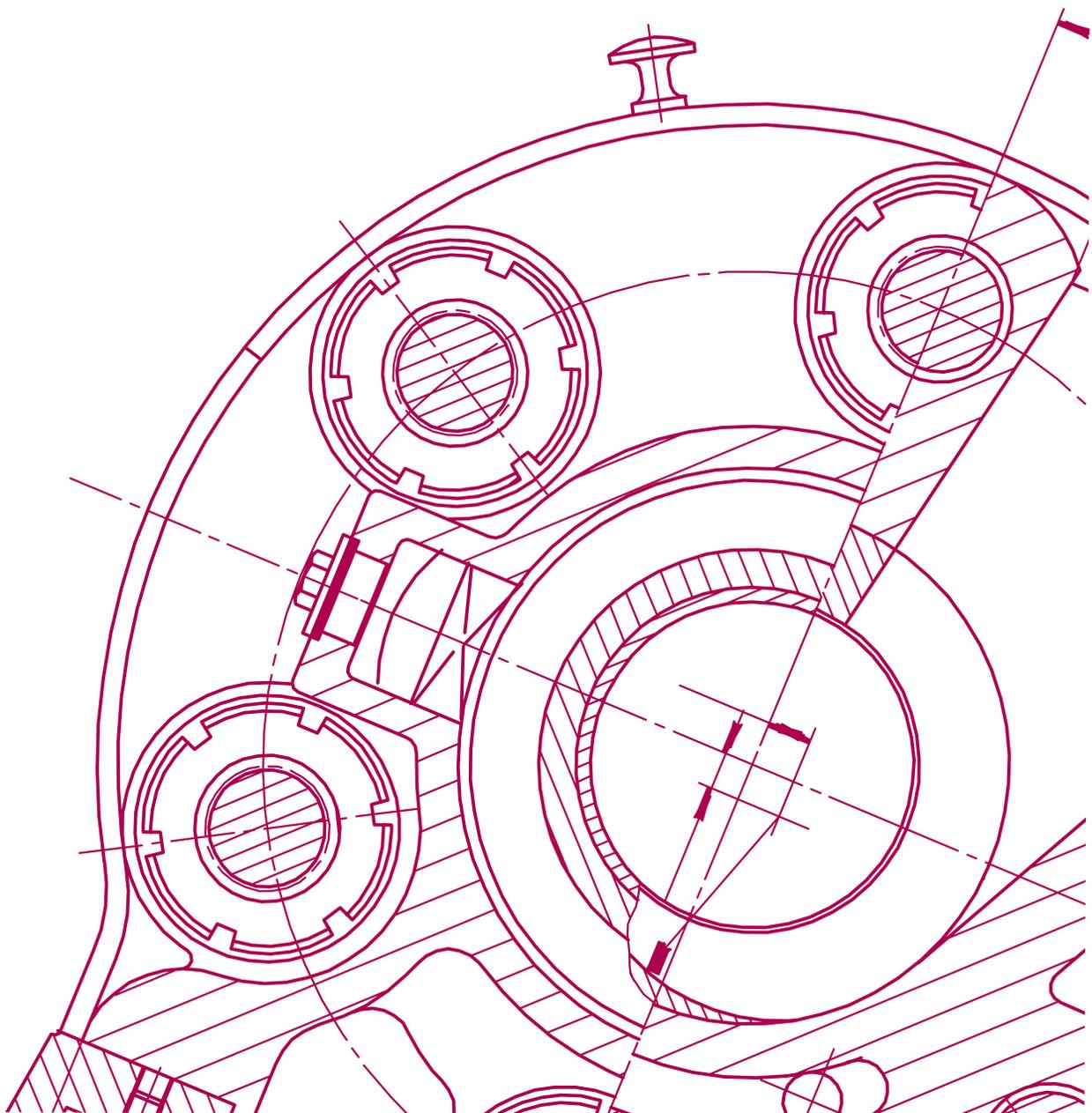
- Performance and efficiencies.
- The recovery process from network failures in the forwarding plane can be controlled from a single point. This greatly simplifies the design and operation of the network.
- The network failures in the forwarding plane can be automatically recovered without the manual intervention of a network operator.
- Offering flexibility to perform failure recovery and traffic engineering tasks simultaneously.

Related Articles:

- S. Cevher, "Multi Topology Routing Based Failure Protection for Software Defined Networks", IFIP Networking, Stockholm, Sweden, 2017 (Submitted)

BIOMEDICAL TECHNOLOGIES

“From past to present treating, diagnosing and monitoring diseases are very important for the human being. Currently, each year billions of dollars are spent for medical and bio-medical researches all over the world in this respect. ÖZÜ conducts researches on biomedical area, and holds biomedical technology patents in the fields of ultrasound imaging systems and hybrid artificial organ application.”



BIONIC AND HYBRID PROSTHETIC HAND EMBODIMENT

Potential Application Area(s)

Hybrid Artificial Organs

Patent Status

TR2013/12431
DE21 2013 000 095.2
PCT/TR2013/000363

Inventor(s)

Asst. Prof. Dr. Erkan Kaplanoğlu

Technology Readiness Level

TRL 5-6

Contact

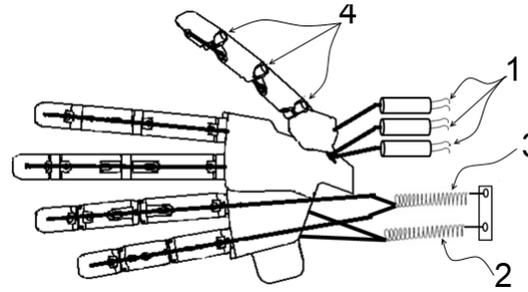
Asst. Prof. Dr. Erkan Kaplanoğlu
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Problem:

Currently, as a result of the researches conducted on the prosthesis users, it is found out that the factors relating to the performance of a prosthetic hand are the functionality, interaction with the surrounding, low weight, high speed of grabbing and power, being noise-free or minimum level of noise and visuality. The ideal prosthetic hands need to meet these criteria. In order to provide the "grabbing" function in the active prosthetic hand embodiments available in the state of the art, various kinds of direct current motor are used on the part that moves the fingers. The functionality and the grabbing power in the systems that are moved by means of direct current motor are high. However, the system works in a noisy way, and it poses a disadvantage compared to a normal human being hand in terms of natural view of a hand and its weight.

Technology:

The object of the present invention is to provide a high grabbing speed and power by using DC motor in the first three fingers as they are more actively used than the other two fingers (ring and little fingers). A further object of the present invention is to provide light and noise-free working by using Shape Memory Alloys(SMA) actuator in the ring and little fingers which move less compared to the first three fingers. The present invention relates to a bionic hybrid prosthetic hand embodiment comprising phalanges springs providing the fingers to return back following the grabbing; so as to provide a hybrid embodiment by using the shape memory alloy (SMA) and DC motors at the same time.



Advantages:

- To fulfill the daily-life activities and be used in a lighter and more effective manner
- Low weight
- Natural view
- Noise-free working
- Low energy-consumption which are necessary for a prosthetic hand performance by making use of SMA

Related Articles:

- E. Kaplanoglu, "Design of Shape Memory Alloy-Based and Tendon-Driven Actuated Fingers Towards a Hybrid Anthropomorphic Prosthetic Hand", Journal Article, "International Journal of Advanced Robotic Systems", ISSN 1729-8806, InTech, September 9, 2012.
- Y. Cotur, C. Gumus, E. Capa, T. Hasekioglu, E. Kaplanoglu, M. Ozkan, "EMG Classification of Index Finger Adaptive to Prosthetic Hand", IEEE Engineering In Medicine And Biology Society (IEEE Embs), 2014.

METHOD AND SYSTEM FOR A PORTABLE ULTRASONIC IMAGING SYSTEM

Potential Application Area(s)

Ultrasound Imaging
Medical Imaging

Patent Status

TR2014/03256
PCT/TR2015/000118

Inventor(s)

Asst. Prof. Dr. Göksenin Yaralıoğlu

Technology Readiness Level

TRL 5

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Problem:

Ultrasonography is an ultrasound based medical imaging technique widely used in medicine. Ultrasound machines cost \$100K-\$250K because of sophisticated multichannel electronics. Additionally, those are sizable and therefore disable to be carried easily by medical practitioners. There is an absolute need for low cost and portable ultrasound imaging systems.

Technology:

The proposed technique uses motion sensors that are embedded with the probe to track the position of the ultrasound signals. This eliminates the use of a transducer array and beam forming electronics and enables very low cost imaging systems. Potentially, this device can make ultrasound imaging routine part of the clinical exam. It could also be used in emergency rooms and ambulances due to its small feature specially to detect internal bleeding.



Advantages:

- Low cost
- Small form factor (handy use)
- Wireless interface

Related Articles:

- N/A



VERTICAL GAP ACTUATOR FOR ULTRASONIC TRANSDUCERS AND FABRICATION OF THE SAME

Potential Application Area(s)

Ultrasound Imaging

Patent Status

PCT/TR2015/050097

TR2014/13718

Inventor(s)

Asst. Prof. Dr. Göksenin Yaralıoğlu

Technology Readiness Level

TRL 3

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Problem:

In order to address the limitations of piezoelectric transducers, capacitive micro machined ultrasonic transducers (CMUTs) have been introduced. Since the first introduction of CMUTs, extensive research has been performed on fabrication, modeling and applications. Main challenges of CMUTs can be traced to lack of high sound pressure generation, low receive sensitivity and highly nonlinear behavior of the parallel plate actuation. There was a need for a new actuation method for the CMUT transducers that will separate the dependence of the output pressure and receive sensitivity on the gap.

Technology:

The main objective of this invention is to develop novel cell geometry for CMUT transducers where the sensitivity and the maximum output pressure do not have conflicting requirements over the gap. This is achieved by defining the gap between a piston type section of the membrane and the sidewalls. In this geometry, the motion of the membrane does not affect the height of the gap where the actuation forces are built. Also there are large cavities under the membrane in the horizontal direction such that these cavities do not interfere with the membrane motion even for large membrane displacement amplitudes. This enables membrane to move without any hard limits.

Advantages:

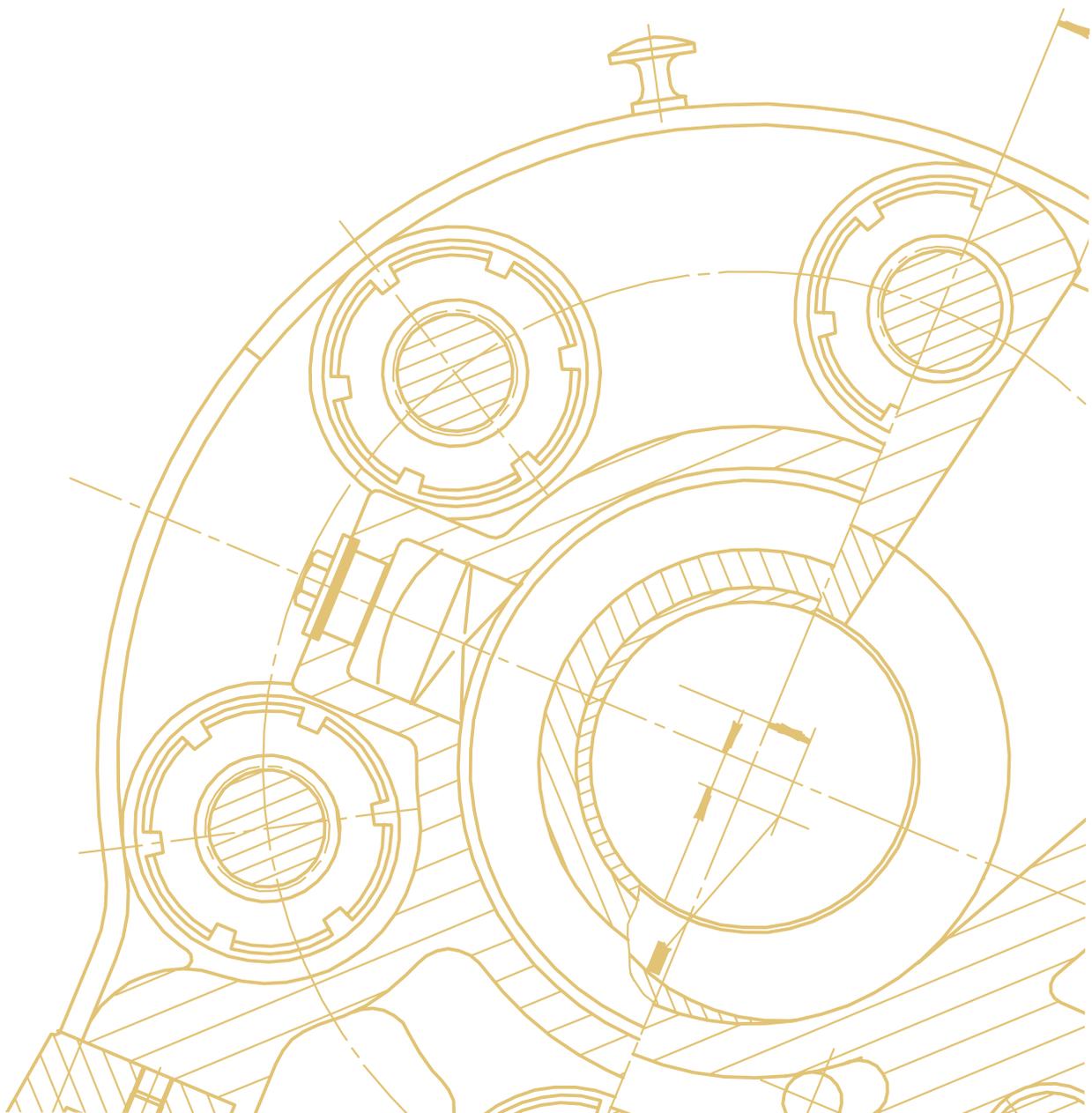
- To solve the low output pressure problem of CMUTs
- Increase in the receive sensitivity
- Cost reduction

Related Articles:

- N/A

CONSTRUCTION MATERIALS

“It is known that construction field has its own traditional materials, and applications for decades; therefore, it is hard to introduce new technologies into the market. However, new technologies present new solutions for ongoing problems. ÖzÜ gives support R&D studies and new technologies on the field of bio-based, sustainable, and more durable cementitious materials”



CEMENT-BASED COMPOSITIONS WITH IMPROVED RHEOLOGICAL PROPERTIES AND METHODS FOR PRODUCTION THEREOF

Potential Application Area(s)

Cement based binders
Grout Injections for Crack Repair

Patent Status

PCT/TR2016/050472
TR2016/00205

Inventor(s)

Asst. Prof. Dr. Zeynep
Bundur Başaran
Ali Amiri

Technology Readiness Level

TRL 3

Contact

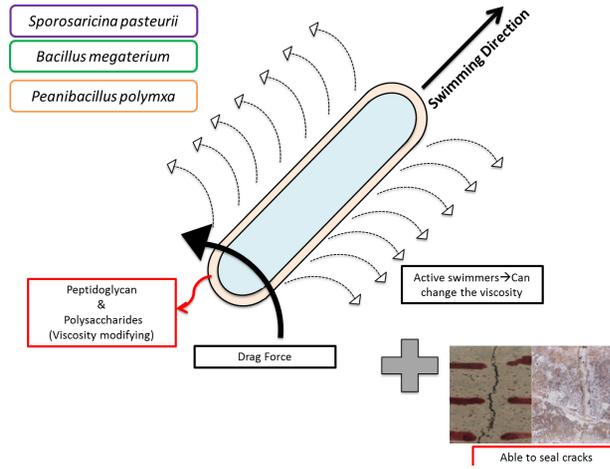
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Problem:

Existing biomaterials in the field of construction are achieved through laborious and costly production processes.

Technology:

The subject of invention composition contains cement material, water, one or more species of bacteria selected from *Sporosarcina pasteurii*, *Bacillus megaterium*, *Bacillus magetrium*, *Bacillus subtilis* and *Paenibacillus polymxa* with or without the presence of nutrient media, and extracellular polysaccharides produced by such species.



Advantages:

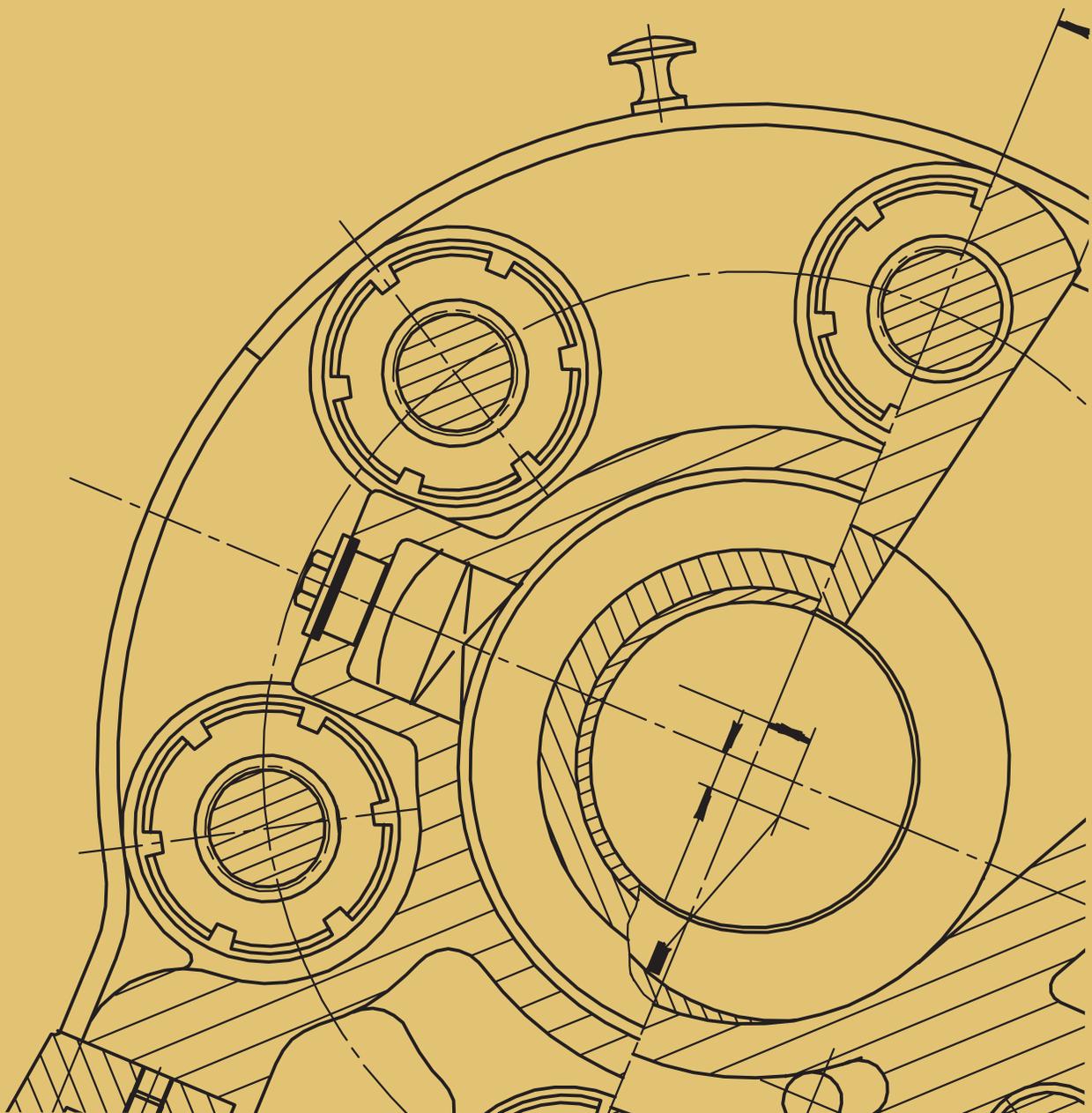
- Closure of cracks on the surface due to the content of the invention
- The increase in resistance to segregation and vomiting of cement based compositions by the use of subject of invention microorganisms
- The fact that the bacteria of the invention are easily found in the soil and in the aqueous regions provides a great economic and environmental advantage for the invention

Related Articles:

- N/A

MECHANICAL TECHNOLOGIES

“From past to present, mechanical technologies have the most known and extensive implementation fields. To contribute for the developments of this main technology, studies in the ecosystem have been supported by ÖZÜ. Within 2016, ÖZÜ applied a PCT application for the radial flux motor.”



RADIAL FLUX MOTOR WITH A CONICAL STATOR AND ROTOR ASSEMBLY

Potential Application Area(s)

Assembly of Motor Mechanics

Patent Status

PCT/TR2016/050140

Inventor(s)

Assoc. Prof. Dr. Caner Aküner
Uğur Demir

Technology Readiness Level

TRL 3

Contact

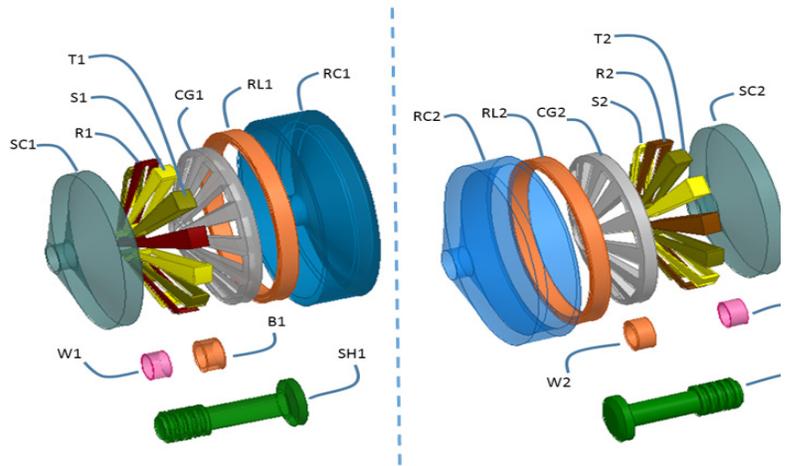
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Problem:

Prior motors, in particular induction motors, have had several disadvantages. Prior motors use a significant amount of air space and can be large and heavy when assembled, making shipping of an electric motor costly. In order to get enough shaft torque, motor length should be increased mostly

Technology:

The present invention provides for advantageous conical geometry of a stator and a rotor, thereby providing both radial flux and axial flux ("radial" flux) simultaneously. In order to get enough shaft torque, the purpose of invention is regarding to reduce increasing motor length by design of conic geometry. In this way, conic geometry provides both decreasing motor length and getting high shaft torque because using radial and axial flux simultaneously.



Advantages:

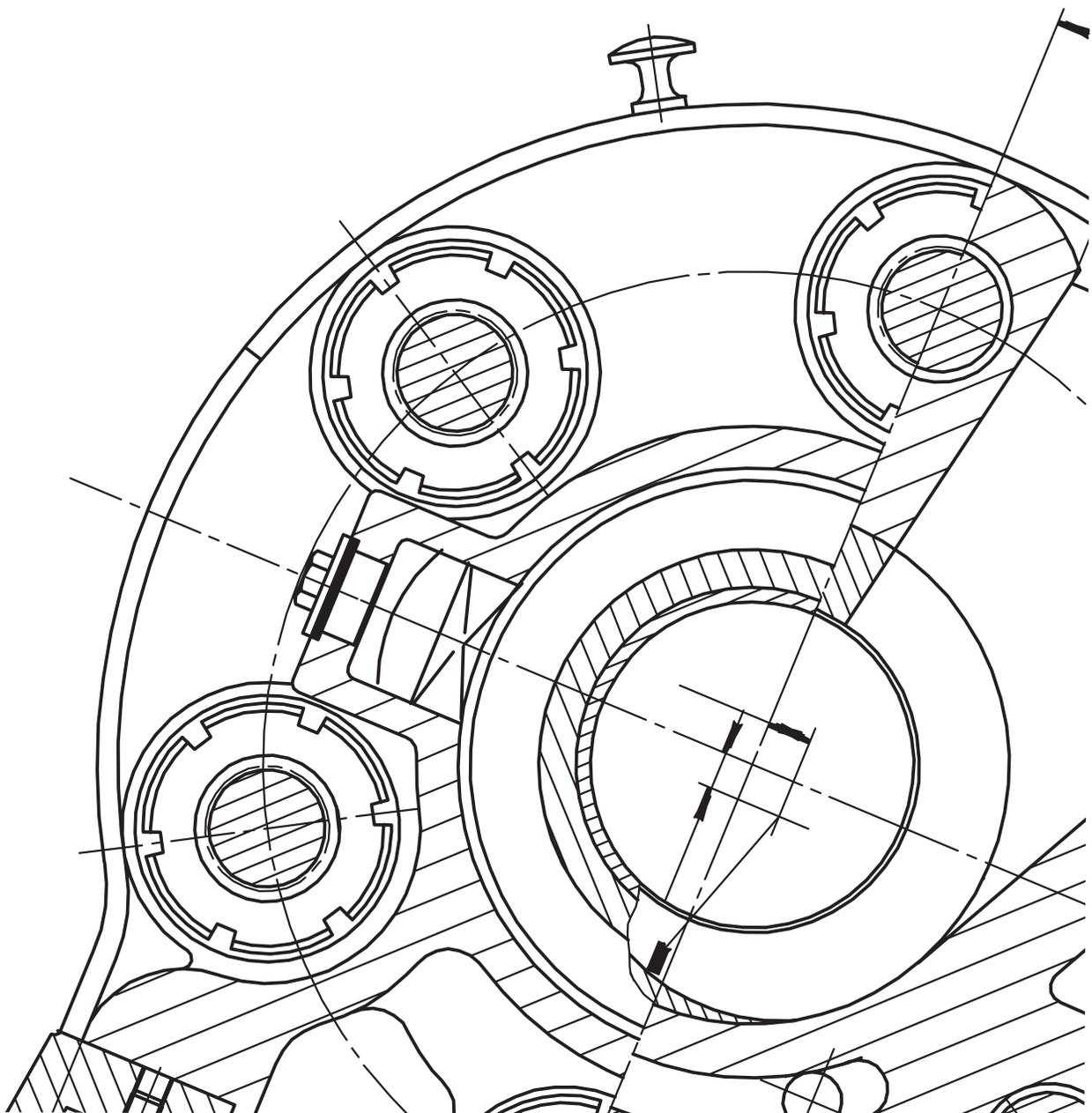
- Invention maximizes and/or optimizes the radial space available in order to advantageously use the increased radial dimension of a conical design to increase the moment arm to increase available torque at the drive shaft of the motor.
- The present invention provides for increased efficiency, torque-speed, and improved space utilization for a motor.

Related Articles:

- N/A

TECHNOLOGIES FOR EDUCATIONAL USE

“Innovation is in everywhere, even in the class experiments. ÖzÜ supports the creation of novel, cheap, and practical course materials. It does not only help enhancing of imagination but also force students to think on the alternatives, and novel ideas. In 2015, ÖzÜ applied for the utility model application for one of these educational apparatuses, parallel capacitance product.”





PARALLEL PLATE CAPACITOR WITH ADJUSTABLE CAPACITANCE

Potential Application Area(s)

Education
Experiment System for High Schools
Colleges and Universities

Patent Status

TR2015/10700

Inventor(s)

Asst. Prof. Dr. Hüseyin Dağ

Technology Readiness Level

TRL 9

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Problem:

In university education, main aim is to teach the technical details and the theory of a topic with examples, or tutorials to be shown. In the case of Capacitance topic of Physics courses, the experimental setups are expensive, might be dangerous for class usage and unnecessarily complex for the level of the students.

Technology:

“The Adjustable Capacitance Parallel Plate Capacitor” Experiment Setup is based on a well-known pedagogical example. Instead of using complex measuring devices, the system provides a variable capacitance which can be measured by simple multi-meters that are already available at laboratories. The systems geometry enables students to measure capacitance of a parallel plate capacitor with variable surface areas and plate to plate distances. Using these properties, students can measure the electric permittivity of air or any dielectric material.

Advantages:

- Easy to produce
- Contains no danger for class usage
- Provides capacitance up to 400 microfarads which is measurable with simple multimeters
- Enables measuring electric permittivity of air and other dielectrics
- Easy to establish

Related Articles:

- N/A



