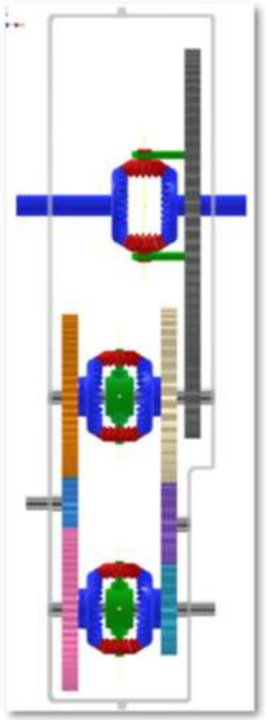
SELF-ADAPTIVE DIFFERENTIAL GROUP

Patent RO134406 / 30.03.2023

Authors: ROMEO CĂTĂLINOIU, SORIN AUREL RAȚIU, IMRE ZSOLT MIKLOS

The invention is an application of Patent RO134406 dated 30.03.2023 and refers to a gearbox intended to ensure the transmission of electrically powered automobiles with the aim of reducing energy consumption and increasing energy autonomy.

The gearbox is characterized by the fact that it continuously varies the value of the transmission ratio, by varying the revolutions of the two electric motors, which can work individually or in tandem.



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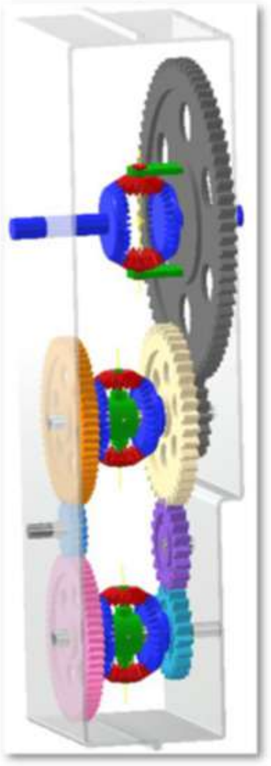

The gearbox is a mechanical reducer characterized by the fact that it provides assistance when pedaling through an electric motor, assistance that can be achieved in three modes: low, medium and high, self-adaptive depending on the value of the load torque that must be overcome.

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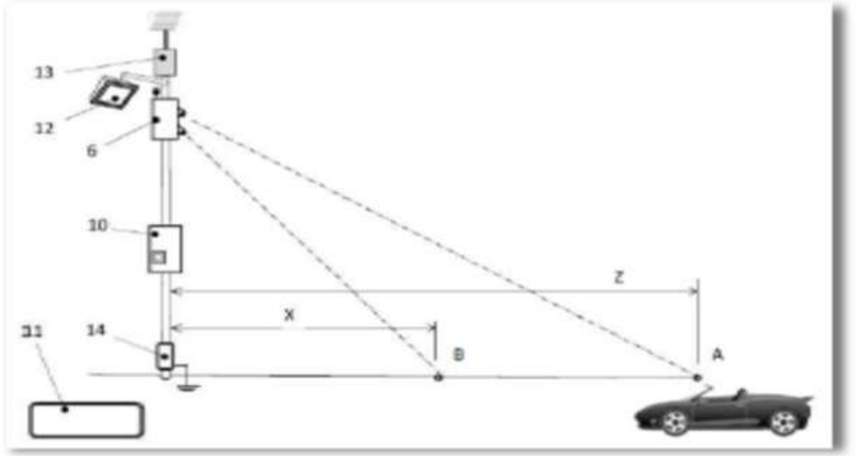
MONITORING SYSTEM FOR CONTROL OF VEHICLE SPEED LIMITS ON PUBLIC ROADS

Patent: *No. O.S.I.M.-A/00001/03.01.2024*

Authors: **Pavel Ștefan, Ungureanu Daniel-Viorel**

The invention refers to a fixed electrical system for preventing accidents caused by excessive speed on public road segments with vehicle speed restrictions.



ADVANTAGES:

Detects when a vehicle exceeds the allowed speed limit on a designated road segment and determines its actual speed.

It prevents the driver from exceeding the legal speed limit.

Verifies compliance with speed adjustment requests.

In case of noncompliance, it neutralises the vehicle's control system through an electromagnetic pulse, causing it to come to a stop.

It records, archives and transmits data via an internet connection to authorised authorities responsible for managing such situations.

The installation is energy self-sufficient.

The installation does not pollute the environment.

The generation of the electromagnetic pulse is automatically disabled when emergency vehicles (police, rescue, firefighters, military, government officials, etc.) pass through the designated area and are reactivated after their passage

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ELECTROSTATIC DEVICE FOR MEASURING ELECTRICAL VOLTAGE WITH OPTICAL INDICATOR ELEMENT

RO 137476 B1

Authors: Ordodi Laurenţiu Valentin, Vatău Doru, Salinschi Marin, Olariu Adrian Flavius, Dumitrel Gabriela Alina, Pană Ana-Maria, Vaszilcsin Nicolae, Dan Mircea Laurenţiu, Mâţiu-Iovan Liliana, Ionel Raul Ciprian, Udrea Ioan Alexandru, Bonciog Daniel Dumitru, Vereş Denisa Alexandra, Stănese Cristian Marcel, Păunescu Virgil, Bojin Maria Florina, Gavriliuc Oana Isabela, Lukinich-Gruia Alexandra Teodora, Negru Şerban, Crîsnic Daniela, Frunză Gigel Viorel

The invention relates to an electrostatic device for measuring high electrical voltages in electrical and energy equipment and in radiological and radiotherapeutic medical equipment.

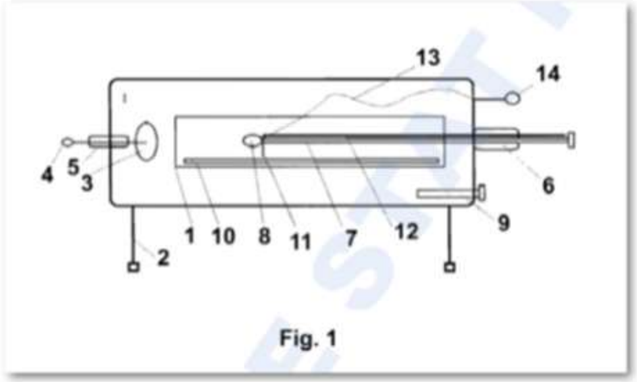


Fig. 1

According to the invention, the device is made in such a way that the direct or alternating voltage to be measured is applied by means of an input terminal (4), insulated with teflon (5) from the ground (14) of the device, to a disk-shaped copper electrode (3) placed in a sealed polypropylene tube (I), with removable side covers and glass window (1), the electrode (3) producing a uniform electric field in the lines of which an optical indicator element (8) slides, said element consisting of a low-pressure neon discharge tube connected to the ground (14) of the device, positioned at the end of a sliding rod (7) coaxial with the disk-shaped electrode (3), until the neon tube emits a red-orange color, i.e. when it is in an area of the electric field with a sufficiently high intensity to generate a luminescent discharge, so that, after reading the distance D on a graduated ruler (10), by means of an indicator needle (11) rigidly fixed on the sliding rod (7), and based on a calibration curve established when the device was put into operation, the applied electrical voltage can be estimated.

PHOTO-CATALYTICALLY ASSISTED FILTERING PLANT FOR TREATING WATER FOR DRINKING PURPOSE

RO 133757 B1

Authors: Manea Florica, Orha Corina, Lazau Carmen, Pode Rodica, Ursu Daniel, Pop Aniela

The invention relates to a photo-catalytically assisted filtering plant, of the multi-layer type, having a double role: to retain the water pollutants as a system for filtering and/or degrading the water pollutants and as photo-catalytic system which requires the use of a UV-type light source.

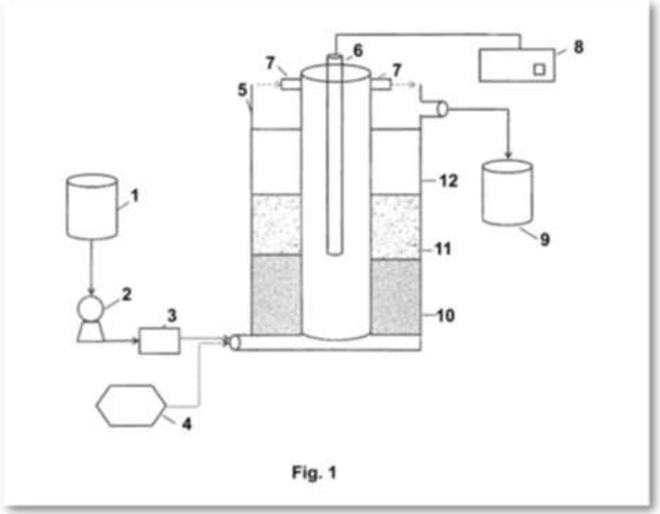


Fig. 1

According to the invention, the plant consists of a multi-layer filtration column (5) filled with three filtering layers: a layer (9) of quartz sand, a layer (10) of zeolite modified with TiOand a layer (11) of active carbon modified with TiO, it is provided with a central concentric cylindrical quartz tube (7) equipped with a cooling system wherein the UV lamp (6) is immersed, said lamp (6) being supplied from a current source (8), the filtration column (5) being supplied, at the lower side, with raw water from the supplying tank (1) by means of a pump (2), it further passing through a flow controller (3) and getting through the filtering layers up to the upper side of the filtration column (5), wherefrom the treated water is collected in the storage tank (9) and where, air is optionally bubbled by the compressor (4).

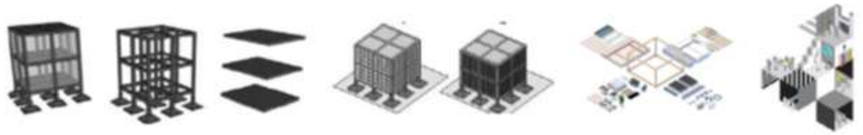
Enhancing Climate Resilience and Sustainability Through Modularity and Flexibility in Architectural Design

Doctoral research project

Author: Kenza Belkhiri

Mentor: Daniel-Viorel Ungureanu

The climate crisis has been ranked with some of the most pressing challenges of the 21st century and calls for very creative architectural responses, if a significantly different built environment is to be achieved. Extreme weather changes, depletion of resources and high temperatures would increasingly result in changes that architecture would need to make in order to better address sustainability and resilience. Modularity is based on prefabrication and standardization, which has very great benefits concerning material waste reduction, simplification of construction processes, and Circular Economy principles by means of scalability and reuse. Flexibility refers to how much a building can adapt to changing functional, environmental, and spatial requirements and lengthens the life of structures as well as reduces their chances of obsolescence. Together, these strategies direct architecture to the dual commands of climate adaptation and mitigation. Inquiry into such concepts advances transformative strategies supportive of environmental stewardship and the goals related to global resilience, thus adding to the broader discourse on sustainable architecture. This paper discusses the merits of combining flexibility and modularity by architectural practices into a strong argument for sustainable design.



Modular construction diminishes the risk of threats and hazards because innovations brought about the flexibility towards joining, allowing for flexible adjustment or updating of architecture when playing varying climate change scenarios, subject to the vagaries of sea-level rise, extreme meteorological activities, and changing environmental requirements. Adaptive building envelope materials like green roofs for passive cooling, natural ventilation units, local energy use, and PV, strategically balancing 'energy efficiency' and 'piece of the planet,' generate a clear reduction in operational carbon emissions. In addition, the precast structure has substantially reduced wood end wastage by almost 50% and yielded means that reduce environmental impact.

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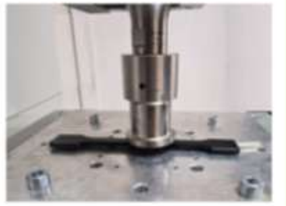
Ultrasonic weldability of composites created through additive manufacturing

Authors: ***Emilia DOBRIN, Gabriela-Victoria MNERIE, Ileana Lavinia SÎRBU***

Ultrasonic welding is a sustainable and non-toxic joining process widely utilized by leading industrial manufacturers and aligned with European circular economy regulations. This study investigates the ultrasonic welding behavior of additively manufactured composites reinforced with materials such as glass fiber, Kevlar (K), and copper wire. These composites are structured in a sandwich configuration with varying reinforcement types and welded using ultrasonic technology. The welded samples were analyzed and compared to the base material through non-destructive (NDT) and destructive testing, including visual inspection, microscopic and macroscopic analysis, tensile testing, hardness testing, and bending tests. The results provide insights into the mechanical performance and structural integrity of ultrasonic-welded, additively manufactured composites.

Test specimens resulting from PETG deposition

Kevlar fabric



Reinforced specimens while being welded with US

Results:

Specimen	E_t [MPa]		σ_m [Mpa]		ε_m [%]		ε_b [%]		b [mm]		h [mm]		A_0 [mm²]	
	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev	No Kev
No. 1	3620	3440	37.2	46.1	0.98	1.3	0.98	1.3	10.25	10.44	4.08	4.25	41.8	44.4
No. 2	3580	3590	41.5	46.5	1.2	1.2	1.2	1.2	10.16	10.25	4.09	4.14	41.6	42.4
No. 3	3320	3450	38.4	48.9	1.2	1.4	1.2	1.4	10.38	10.34	4.2	4.27	43.6	44.2
No. 4	3560	3690	36.5	54.0	0.98	1.4	0.98	1.4	10.25	10.3	4.15	4.52	42.5	46.6

Advantages of the process:

Reduces human involvement in the 3D printing production process. Eliminates certain production steps, as they are integrated into the 3D printing workflow. Ultrasonic treatment enhances the mechanical properties of the final parts without altering the 3D-printed material.

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SYSTEM AND METHOD FOR DETERMINING VERY LOW ELECTRICAL RESISTANCE OR ELECTRICAL RESISTANCE AT INTERFACIAL CONTACT

A 2024 00220 din 26.04.2024

Authors: Ercuţa Aurel, Crăciunescu Corneliu-Marius, Vaszilcsin Nicolae, Kellenberger Andrea, Mitelea Ion, Laedre Sigrid, Khoza Thulile

The invention relates to a system for measuring the values of current and voltage through a sample the very low resistance of which is to be determined and to a method for accurately determining the same, or for determining the electrical resistance at the contact between faces, for a sandwich-type sample.

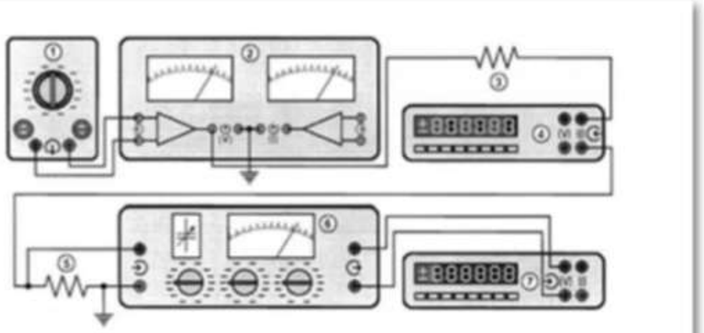


Fig. 1

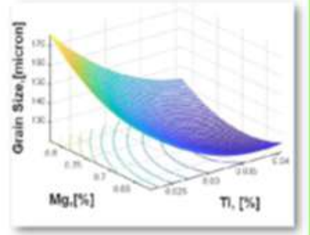
According to the invention, the measuring system comprises a low-frequency oscillator (1) which generates a sinusoidal voltage of controllable frequency and amplitude, having a value set depending on the material of the sample to be measured, which is amplified by means of an operational bipolar power source (2) which further supplies a series circuit consisting of a current limiter (3) with known resistance and a milliammeter (4) of alternating current for measuring the effective value of the current intensity through the measuring sample (5) which closes the circuit at the reference potential (ground), the voltage drop on the sample (5) being amplified by means of a selective nanovoltmeter (6) with the RLC circuit tuned to the excitation current frequency (in resonance) so that the voltage value at its output, measured by means of a digital millivoltmeter (7), is used for determining the actual value of the voltage drop on the sample (5), calculated separately for each measuring range used, taking into account that the voltage is normal at the maximum indication for each range, at the output of the nanovoltmeter (6). The claimed method uses the values of current and voltage through the sample to be measured, determined with the above-described system, so that the very small value of the sample electrical resistance or the resistance at the contact between faces, in the case of sandwich-type samples, can be determined accurately.

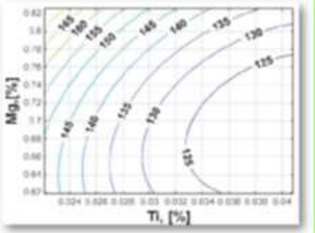
ALUMINUM ALLOYS FOR CAR RIMS

PhD Thesis

Authors: Doru SAPTA, Ana SOCALICI, Corneliu BIRTOK BANEASA , Vasile PUTAN

Aluminum alloy 6082 is used in various applications in the automotive industry, construction, and the transportation sector. It is widely used and has replaced alloy 6061 in many applications. It has high corrosion resistance and high hardness. It is very difficult to achieve fine-grained structures in aluminum alloys through various processes. In the case of aluminum alloy 6082, the hardening phase is Mg2Si. Its size is determined by the presence of iron and silicon. These alloys use magnesium and silicon in their composition, can be heat-treated, have good forgeability, and high corrosion resistance. Globally, the manufacturing of automotive wheels is carried out using aluminum alloys through casting and/or plastic deformation.





The experimental data were collected and processed statistically. The goal was to establish correlations between grain size (considered a dependent parameter) and the chemical composition elements that influence grain refinement. It is observed that the alloying elements Si, Mg, Mn, as well as Ti, used for grain refinement, positively influence the mechanical properties within the limits of these elements. Specifically, an increase in Ti leads to finer grain size, which also results in higher values for mechanical characteristics.

Using high-quality charge materials leads to minimal variations in the chemical composition elements, and following alloying, only small differences in chemical composition are observed from one batch to another. The narrow variation limits for chemical elements resulted in acceptable variations in the alloy's qualitative characteristics.

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Innovative Application of Concentrated Solar Power for Testing Hybrid Thermal Barrier Coatings

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[2]Institute of Plasma Physics of the Czech Academy of Sciences, U Slovanky 2525/1a, Prague, Czechia

The innovation relates to a new method of testing hybrid thermal barrier coatings (TBCs) which are widely used in turbines for propulsion and power generation using Concentrated Solar Power (CSP). The development of TBCs for high temperature applications requires rigorous testing under extreme conditions. Understanding the degradation mechanisms at high temperatures is essential for improving the performance of TBCs. Thus, for the present study, TBCs were produced using a water/argon stabilized plasma system from yttria-stabilized zirconia (YSZ), yttrium aluminum garnet (YAG), and gadolinium zirconate (GZO) suspensions mixed with coarse YSZ powders. Current test methods include isothermal and thermal cycling, but these have limitations such as limited temperature and high-test cost. In addition, the presence of the particles derived from desert sands or volcanic ashes, so called CMAS (CaO-MgO-Al_2O_3-SiO_2), may be encountered during operation. Its infiltration into TBCs causes coating failure through cracking and delamination, leading to premature maintenance.

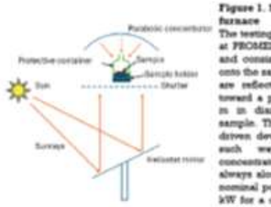

Figure 1. Schematic of solar furnace

The testing procedure was carried out at PROMES laboratory, CNRS, France and consisted of focusing solar rays onto the sample's surface. The sunrays are reflected by a heliostat mirror toward a parabolic concentrator of 2 m in diameter located above the sample. The heliostat is a computer driven device that tracks the sun in such way that the parabolic concentrator receives the sun beam always along the same direction. The nominal power of the furnace was 1.4 kW for a direct normal irradiation of 1000 W/m^2 with a concentration rate of ~ 15000 for a focal spot of ~ 1 cm in diameter.

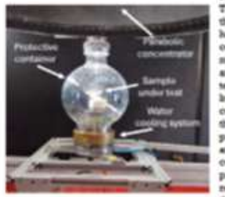

Figure 2. Experimental setup

The samples were placed on the thermally insulating ceramic sample holder to isolate it from the water-cooled table. The temperature was measured by a thermocouple placed at the rear side of the sample. The temperature was controlled manually by adjusting the light intensity on the coating's surface by opening/closing the carbon shutter. The testing was performed in the open-air atmosphere. A protective glass container was used to prevent potential material loss in case of a rapid coating spallation due to thermal shock, especially when using CMAS during the tests.

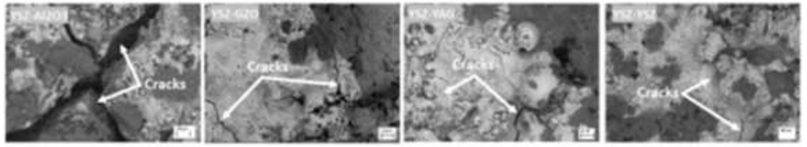

Figure 3. Representative SEM micrographs of free surface of YSZ-based hybrid coatings successfully tested using CSP at 1000°C with CMAS

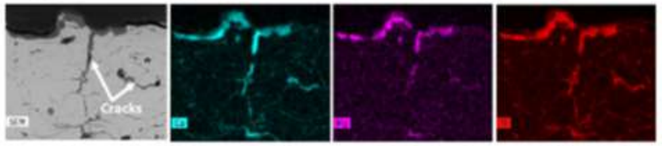

Figure 4. Representative cross-sectional SEM micrograph and EDS maps of a hybrid YSZ-YAG coating tested with CMAS at 900 °C. The coating was successfully tested using CSP, revealing infiltration of Ca, Mg, and Si within the coating

In this study a novel high-temperature testing method using CSP was used to test hybrid TBCs which can reveal new behaviors, failure modes or properties of coatings. The method significantly reduces energy costs, test time and environmental impact compared to traditional testing methods such as isothermal and thermal cycling, while reducing the negative impact of CMAS on test equipment. This innovative method not only deepens our understanding of how TBCs perform under extreme conditions but also provides valuable insight into the development of efficient and environmentally friendly testing methods for aerospace and energy applications. This method provides cost-effective and sustainable testing for the next generation of TBCs, while minimizing the impact on the environment and test equipment in line with global energy sustainability goals.

Acknowledgments: Financial support through projects 23-21478S "High-enthalpy deposition of hybrid plasma spray coatings" funded by Czech Science Foundation and Solar Facilities for European Research Area—Third Phase (SFERA III), Grant Agreement No. 823802 are gratefully acknowledged.

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