Інше

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SMART MANUFACTURING ECOSYSTEM

Summary. *Transformation and upgrading (Gentrification) of smart industrial spaces with simultaneous revitalization and reconstruction.*

The article examines methods and techniques for the sequential adaptation and transformation of the properties and characteristics of elements in the infrastructure of a smart production facility. This includes startups in the brownfield category, transitioning in the first stage to the smart brownfield category, with subsequent adjustments to all ecosystem characteristics as a whole to align with the greenfield stage. Finally, in the third stage, a transition is made to align with the smart greenfield category.

Key words: *transformation of premises, startup ecosystems, stabilization of the psychological climate, psychological climate of startups, visual stabilizers of the psychological climate, infrastructural stabilizers of the psychological climate, combined systems of psychological climate stabilizers.*

Purpose. The sections of this publication provide definitions, explanations, and characteristics that outline the criteria for compliance with all categories of characteristics and parameters of smart production facilities across the following classes:

- Brownfield;
- Smart Brownfield;
- Greenfield;
- Smart Greenfield.

In relation to the additional conditions, characteristics, and requirements that have arisen and continue to arise in the context of creating and accommodating innovative projects with their entire ecosystem and specific features, designers and builders are constantly engaged in creative exploration.

Introduction. Of course, all of this represents approximate content for documents, and for each project, depending on its specifics and market implementation conditions, as well as the requirements of potential investors, this list may vary significantly.

Particular attention should be paid to projects in the fields of biotechnology and genetic engineering. For such projects, a special expert, technological, and commercial review is likely required.

To ensure the descriptions are as close to reality as possible when constructing smart facilities, the author of this publication exclusively referenced effective and popular projects developed by the renowned specialist in this field, Bohdan Vytyv.

Revitalization

Revitalization of industrial buildings differs from reconstruction as it involves changing the functional purpose of the building while preserving it as a valuable historical and cultural asset, without altering its exterior. Virtually all changes to the building itself are confined to the interiors.

After revitalization, buildings can serve various purposes: cultural or recreational (museums, art centers, creative spaces), commercial (shops, shopping centers), or economic (office centers).
A distinctive feature of revitalization is that the above-mentioned purposes can be successfully combined while preserving historical buildings.

Economic support for revitalization processes may vary. American urbanist Brent Ryan identifies two types of revitalization depending on the source of initiative and funding: "top-down" (initiated from above) and "bottom-up" (initiated from below).

- Top-down projects are typically costly and initiated by municipal authorities, who often provide financial support.
- Bottom-up projects are less expensive, with initiatives originating from local entrepreneurs, cultural communities, etc.

The concept of a smart production building and a smart production space, as part of a specialized ecosystem for the development of new innovative projects, is much broader. It also includes the introduction of psychological climate stabilizers at all levels of the ecosystem infrastructure. These include:

- Visual stabilizers of the psychological climate
- Infrastructural stabilizers of the psychological climate

All types and variations of such stabilization create and foster a psychological environment conducive to the brainstorming process so critical for the development of startups.

The Essence of Revitalization

The primary principle of revitalization lies in uncovering new opportunities for old territories and buildings.

A comprehensive approach is used in the revitalization process to preserve the uniqueness, authenticity, identity, and historical resources of the urban environment and industrial zones, while also considering the specifics of startups.

Revitalization originated in industrialized nations during the second half of the last century, significantly impacting the appearance, infrastructure, and demographic situation of many cities.

Revitalization may involve relocating industrial enterprises, resettling people, and changing the functional purpose of certain urban spaces and buildings.

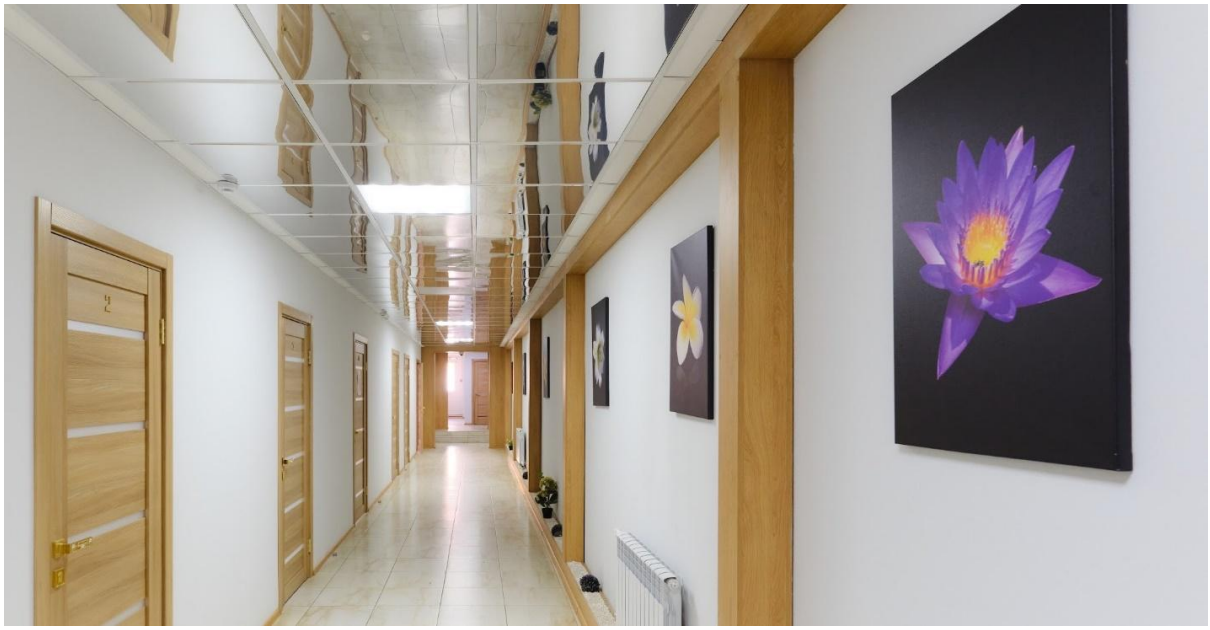

Fig. 1. The figure shows the view of an innovation corridor as part of the ecosystem of a smart production facility in a restored industrial building designed for startups.

Gentrification. Gentrification refers to the improvement of previously unattractive areas in terms of infrastructure. Typically, this process involves industrial zones, urban outskirts, or neighborhoods built during the Soviet era for workers. These areas are transformed into comfortable urban spaces and business centers. As a result, the reputation of the old neighborhood changes, and gradually, people begin to seek quality new housing in these areas. Dilapidated buildings are demolished and replaced with modern homes.

For developers, gentrification is a way to implement their projects even in parts of the city where no free land remains. For the city, it is an opportunity to revitalize abandoned areas.

Perhaps one of the most well-known examples of gentrification is the High Line elevated park in New York City. Previously, this space was a railway for freight trains; today, it is a park spanning over two kilometers, visited annually by several million people. The High Line is not only a recreational area but also a venue for contemporary art exhibitions.

Thanks to the creation of this new public space, real estate prices in the surrounding areas have significantly increased. Old, low-budget buildings have been replaced by higher-class complexes. Currently, around 30 development projects have been completed near the park.

The primary residents of such clusters include representatives of creative industries, architectural studios, art galleries, shops, offices, and coworking spaces. An important feature of the space is the availability of numerous locations for photo shoots.

Similar projects can be found in provincial areas. For example, the "Art Square" district in Ufa. The investor set an ambitious goal to create a beautiful creative center in the city. This space was once a regular factory, but today it has become a favorite leisure spot for locals and visitors. Shops, showrooms, cafes, bars, smart offices, craft workshops, and art salons have opened here.

A key part of the project was the restoration of historic buildings, abandoned factories, and other structures, which have now turned into tourist attractions. Naturally, the implementation of this project increased the capitalization of the district and nearby land.

A noteworthy example of gentrification is the transformation of the Polish city of Lodz. Once a major industrial and wealthy center of the textile industry, production declined, as did the factory buildings. This occurred between 1989 and 1993, following the fall of the communist regime in Eastern Europe.

Over time, the red-brick factory buildings, mansions, and Art Nouveau-style houses located in the city center began to attract tourists. The city's industrial heritage and examples of Polish modernism became some of the first tourist attractions.

The interest of travelers and the efforts of local authorities resulted in the creation of remarkable projects involving the repurposing of factories into cultural centers, museums, and residential spaces.

Projects of gentrification and revitalization of former seaport areas have become widespread in Northern Europe. For instance, in Amsterdam, Copenhagen, and Hamburg, former industrial zones located in port areas, often connected to historical locations, have been transformed by developers. These projects take quite a long time to complete, but the results exceed all expectations. In Copenhagen, for example, a sandy beach with a reservoir for paddleboarding and swimming was created on the site of a former industrial zone. Naturally, housing and commercial spaces also emerge, revitalizing the area and integrating it into the city's life.

In Russia, a notable project for reorganizing an industrial zone is "Sevkabel" in St. Petersburg. The territory of former enterprises was converted into a large creative cluster. With the growing number of visitors, infrastructure is also expanding, which is expected to increase the status and value of the residential sector.

Brownfield: An industrial park created on previously developed land. Such sites, often already equipped with infrastructure, are transformed through reconstruction or renovation.
Greenfield: An industrial park created on a specially allocated plot of land that lacks infrastructure.

The conditions for technical creativity that have developed in recent times are largely shaped by the global division of labor between countries and regions with varying levels of development and fundamentally different mental and technocratic traditions.

Historically, the foundational ideas for the development of technology and engineering (with rare exceptions) were born in Europe and the United States. This trend has largely persisted to this day. However, it must be acknowledged that the entire process from the inception, formulation, and crystallization of an innovative idea to the production of a new product or any other type of practical

realization has undergone significant fundamental changes. It seems that the innovative community has not entirely adapted to these changes.

These fundamentally altered conditions—or even the "changed rules of the game" in the innovation field—force inventors to seek new approaches to organizing the innovation process and to develop new foundations for relationships between inventors, investors, manufacturers, and sellers of innovative products.

Naturally, the innovation expansion of these newly created productions does not stop at the component market but increasingly encroaches on the markets of finished products of various kinds and purposes. It is now evident that re-establishing the production of basic components in countries where they were previously manufactured is neither physically nor economically feasible. Developers of cutting-edge innovative products must take into account the uncomfortable reality that component manufacturers can easily seize the initiative. Leveraging their significant advantage in production costs, they could independently develop and manufacture new innovative products, potentially pushing established companies that invest colossal resources into advancing innovative technologies to the margins of the market.

How can individual inventors navigate situations where even large corporations cannot fully protect their interests in intellectual property?

As the author sees it, the idea must first be properly formulated and, as much as possible, protected using scientific and technical methods rather than solely legal measures. Naturally, many options exist, each of which accounts for key nuances and details that pave the way for the successful implementation of an innovative idea.

On the path to implementing progressive and innovative ideas, authors often face numerous systemic traps. These traps may be exploited by patent specialists in large and medium-sized companies to identify, appropriate, or simply steal the idea.

Stabilizing the Psychological Climate is one of the tools to protect the innovative products being developed in a startup.

Since the primary idea and its patent protection may significantly change during this process, the initial version of the agreement for testing feasibility may also undergo substantial revisions. In such situations, psychological rehabilitation for startup employees becomes critically important and necessary.

In these circumstances, it is challenging for authors to independently define the limits of what is possible and formulate their demands and claims toward investors. Furthermore, the technical situation may necessitate involving specialists with profiles and capabilities that the authors of the innovative idea do not possess.

In this case, a comprehensive solution is necessary, both in technical and commercial-patent aspects. Again, if the investor is interested in the further continuation of the project, the most appropriate and effective decision might be joint ownership of intellectual property and joint execution of the project.

As convincingly demonstrated in the characteristics of his innovative developments by Bogdan Vityv, the conditions for technical creativity that have emerged recently are largely influenced by new directions in the development of building and architectural technologies. These, in turn, arose based on the requirements and new standards of smart homes, and are also connected to the global division of labor between countries and regions with varying levels of development, as well as fundamentally different mental and technocratic traditions.

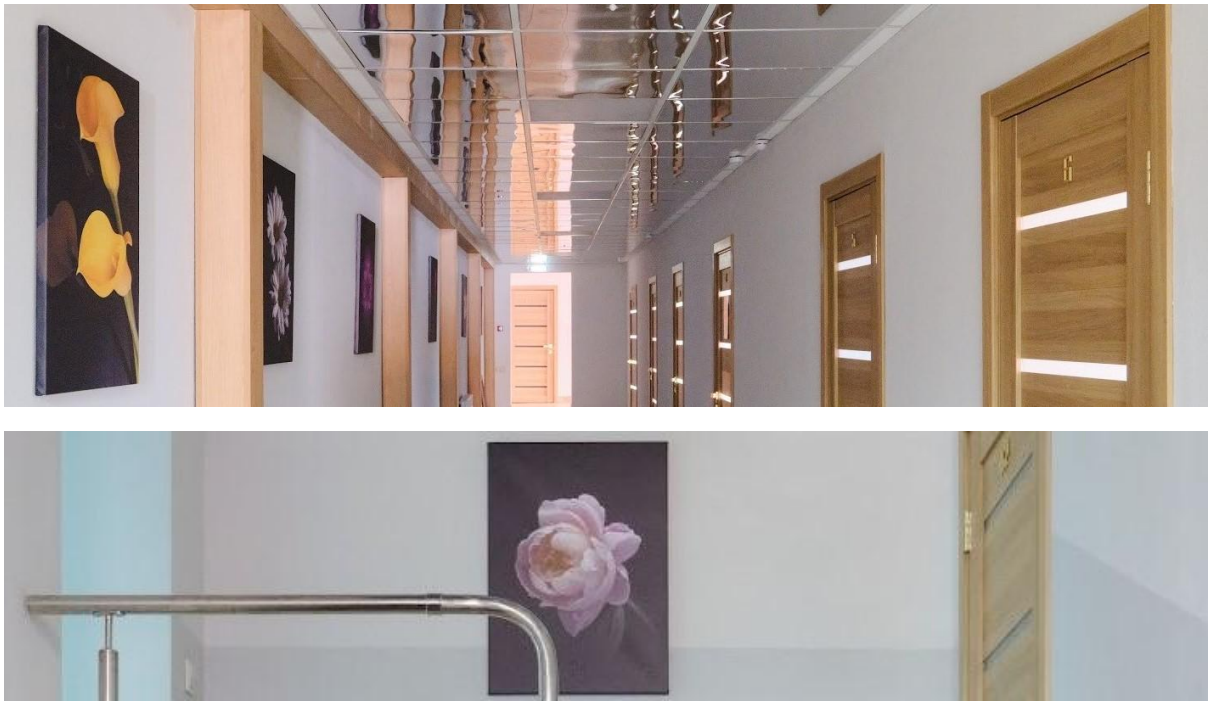

Fig. 2, 3. The figures show fragments of the working corridor in a renovated industrial building

A new interpretation of finishing elements of the structural components of a smart home is proposed in the new projects by Bogdan Vityv as visual and design tools that contribute to stabilizing the psychological climate and, most importantly and valuably, ensuring the reliability and convenience of operating a smart building in the context of brainstorming sessions and the intense work of a startup team and also ensuring similar stabilizing effects for other startups located in the same space.

Fig. 4. The figure also shows a lawn with flowers planted on a surface covered with ceramic particles, with the color of the ceramics harmonizing with the flowers and the structural elements of the walls of the industrial building

This space design concept between buildings, also developed and proposed by Bogdan Vityv in his projects, helps to accommodate technological incubator projects or even multiple technological incubators in such modernized smart spaces.

These opportunities allowed Bogdan Vityv to develop conditions and proposals for organizing new technological incubators in Ukraine, utilizing the advantages that Ukraine possesses.

Fig. 5. The figure also shows a lawn with flowers planted on a surface covered with ceramic particles, where the color of the ceramics harmonizes with the flowers and the structural elements of the walls of the industrial building.
The entire interior space between the production buildings is occupied by unique lawns with flowers in various tones, and the entire surface of the lawn is covered with fine gravel that matches the color of the restored walls of the production buildings after gentrification and revitalization

Requirements for projects developed in technological incubators. The materials of the project, when presented to the intermediary company, should contain or are recommended to include the following documents and materials:

Composition and structure of intellectual property objects owned by the company or initiative group applying for the project. Typically, all technological directions at various stages of development within the applicant company are comprehensive intellectual property objects. Each technological direction should be represented by a systematic structure of components, which includes the following key documents:

- Forecast of technological development for the near and distant future;
- Patent and licensing strategy for all products in the direction, covering all stages of the project, production, and marketing;
- Principal and basic patents for inventions that form the foundation of the technological direction;
- Patents for applications arising from the development of the technological direction;
- Inventions created by the employees and partners of the applicant company before the establishment of the company, which have author certificates or other legal documents;
- Reports on scientific research and experimental design work carried out by employees and partners of the applicant company outside of the company for this technological direction;
- SolidWorks models for all modifications of the products in the technological direction, including all assembly, node, part variants, and models for digital and virtual simulation of product performance;
- Basic principles of technology for manufacturing components and assemblies of the products in the technological direction;
- Complete set of working design and technological documentation for manufacturing the products in the technological direction;

- Corrected CNC machine programs for manufacturing experimental product samples in this technological direction;
- Programs and methods for all necessary types of testing of experimental samples and products in the technological direction at all stages of production;
- Working models of innovative products in the technological direction and results of field testing of technological agricultural products;
- Operational and accompanying documentation for products in the technological direction, including technological instructions for installation, conservation, storage, repair, and transportation;
- Working experimental product samples in the technological direction;
- Technical descriptions of the principles and devices of special technological equipment for manufacturing basic parts and assembling products in the technological direction;
- Materials for patent applications for the aforementioned special technological equipment.

Of course, this is a general outline of the documents, and depending on the project's specifics, its conditions for implementation in the market, and the requirements of potential investors, this list can change significantly.

Projects in biotechnology and genetic engineering should especially be noted; such projects likely require special expert-technical and commercial analysis.

Proposal for organizing technological incubators in Ukraine

There are all the necessary conditions and prerequisites for establishing technological incubators in Ukraine: Thousands of qualified specialists are working, and over the years of stable

operations in defense enterprises, enormous industrial and technical experience has been accumulated. Engineering personnel, trained over many years, possess a high level of professional expertise required for initiating innovative technical solutions.

In Ukrainian enterprises and rural areas, there is unique agricultural production experience, combined with special, unrivaled natural conditions (such as the famous Ukrainian black soil), which create prerequisites for establishing highly efficient and profitable agricultural enterprises. Of course, covering the entire country with technological incubators is impossible and unwise because, despite their technical and commercial revolutionary potential, the creation of highly effective technological incubators remains an evolutionary process.

The organization of the first steps in the development of technological incubators in Ukraine or any other region can be carried out in the following sequence:

1. Based on the expertise of Ukrainian specialists, it is necessary to determine the area of technology where the country's combined scientific, commercial, and historically established potential is the highest and most competitive.

2. It makes no sense to make premature predictions. As the author of this publication believes, it is most appropriate to announce a competition for the best technological project in all production sectors, especially agriculture, in all regions of Ukraine. To evaluate the technical and commercial level of proposed projects, it is advisable to form competition conditions and an expert group, inviting commercialization specialists from the USA (who have already expressed interest) for the first stage of evaluation. In the second evaluation stage, when the most promising projects are selected, investment fund representatives with experience working in Ukraine should be involved. Many of these representatives are already familiar with the idea of organizing technological incubators in Ukraine and have shown interest.

The activity area of a technological incubator in one of Ukraine's regions is divided into work in Ukraine and international cooperation. The following sequence of organizational-technical stages is proposed for the formation of the project (assuming the incubator has already been opened):

1. The project initiator or author prepares the necessary information and technical documents and finds an initial private or other investor of at least $50,000. If the authors or initiators struggle to find one, it makes sense to contact a company that specializes in this.

2. Upon receiving the first private investor, the authors of the innovation, possibly with the investor or the investor's representative, come to the technological incubator, where, under specific standard conditions developed by the incubator, the project is organized, and a new innovative company is created.

Now, it makes sense to briefly outline the standard (for this technological incubator) conditions.

Investments in the new company should include private investments (around $50,000 minimum, but private investments can be higher if the investor is confident in the project).

The rest of the required funds (approximately $400,000) are provided by the technological incubator.

Both the private investor and the incubator do not contribute all the funds at once; the company initially receives an advance of 10% of the total investment, and further funds are allocated as the project progresses, subject to the completion of each phase. Thus, investors protect themselves from any technological mistakes or failures during the project, as the next financial tranche is made only after errors are corrected and phase results are positive.

How are company shares distributed?

When the company is established, the project authors receive 50% of the shares, the private investor who contributed $50,000 receives 15%, and the remaining 35% is divided between the technological incubator (25%) and the

employees of the company who contributed the most to the project's implementation (10%).

Repayment of funds is made after the first profit is received from the project, and no more than 5% of the profit annually. In case of failure and the inability to generate commercial profit from the project, the invested funds are not returned.

Naturally, to attract investors, government and state structures should find appropriate incentives, the most significant of which should be exempting the new company from profit taxes for at least 10 years after receiving the first profit.

All of the above are just assumptions, and in reality, other options for organizing and implementing an innovative project may arise.

Now, let's assume the project was successful and economically efficient. In this case, there will be additional opportunities for its commercial realization. This concerns options for entering foreign markets and, again, if circumstances are favorable, the possibility of listing the company on stock markets in the US or European countries.

List of references and patent sources of information

Appendix 1

United States Patent Application **20100193445**
Kind Code **A1**
August 5, 2010

FOAMING OF LIQUIDS
Abstract

Methods and systems for processing of liquids using compressed gases or compressed air are disclosed. In addition, methods and systems for mixing of liquids are disclosed.

Appendix 2

United States Patent Application **20100224497**

Kind Code **A1**
September 9, 2010

DEVICE AND METHOD FOR THE EXTRACTION OF METALS FROM LIQUIDS

Abstract

A volume-porous electrode is provided which increases effectiveness and production of electrochemical processes. The electrode is formed of a carbon, graphitic cotton wool, or from carbon composites configured to permit fluid flow through a volume of the electrode in three orthogonal directions. The electrode conducts an electrical charge directly from a power source, and also includes a conductive band connected to a surface of the electrode volume, whereby a high charge density is applied uniformly across the electrode volume. Apparatus and methods which employ the volume-porous electrode are disclosed for removal of metals from liquid solutions using electroextraction and electro-coagulation techniques, and for electrochemical modification of the pH level of a liquid.

Appendix 3

United States Patent Application **20100224506**
Kind Code **A1**
September 9, 2010

PROCESS AND APPARATUS FOR COMPLEX TREATMENT OF LIQUIDS

Abstract

Methods and apparatus for complex treatment of contaminated liquids are provided, by which contaminants are extracted from the liquid. The substances to be extracted may be metallic, non-metallic, organic, inorganic, dissolved, or in suspension. The treatment apparatus includes at least one mechanical filter used to filter the liquid solution, a separator device used to remove organic impurities and oils from the mechanically filtered liquid, and an electroextraction device that removes heavy metals from the separated liquid. After treatment within the treatment apparatus, metal ion concentrations within the liquid may be reduced to their residual values of less than 0.1 milligrams per liter. A Method of complex treatment of a contaminated liquid includes using the separator device to remove inorganic and non-conductive substances prior to electroextraction of metals to maximize the effectiveness of the treatment and provide a reusable liquid.

Appendix 4

United States Patent Application **20110069579**
Kind Code **A1**
March 24, 2011

FLUID MIXER WITH INTERNAL VORTEX

Abstract

The present disclosure generally relates to a fluid mixer, a system for mixing fluids utilizing the fluid mixer, and a method of mixing fluids using the fluid mixer or the system for mixing fluids, and more specifically, to a compact static mixing device with no moving parts and capable of mixing any fluid, such as air, nitrogen gas, water, oil, polluted water, and the like. A first pressurized, incoming fluid is accelerated locally by a section reduction, is split into streams, and then is released into a second fluid found in a closed volume or an open volume after a period of stabilization. The directed and controlled first fluid slides along an insert up to directional and angled fins at a vortex creator where suction forces from a self-initiating vortex in an internal cavity draws in at least part of the first fluid to fuel the vortex. The compactness and simplicity of the fluid mixer with internal vortex can be used alone within a closed volume in a conduit, in a sprayer, or within a fixed geometry to direct the mixing vortex to specific dimensions. One or more fluid mixers can also be used in an open volume such as a reservoir, a tank, a pool, or any other fluid body to conduct mixing. The technology alone, as part of a multi-mixer system, or as a method of mixing using the fluid mixer with internal vortex is contemplated to be used in any field where mixing occurs.

Appendix 5

United States Patent Application **20120102736**
Kind Code **A1**
May 3, 2012

MICRO-INJECTOR AND METHOD OF ASSEMBLY AND MOUNTING THEREOF

Abstract

The invention relates to a compact device for producing a composite mixture made of two or more fluids, and for aerating and energizing the composite and injecting it into a volume, and more specifically a micro-fuel injector mixing water, air, or any other types of fluid before it is injected into a volume such as a combustion chamber of an engine made of stackable mechanical elements, and the method of assembly and mounting thereof.