



- 1. CHIP-BASED CIRCULARLY POLARIZED LIGHT DETECTOR**
- 2. MULTI-STAGE DEPOSITION IMPROVES PRODUCTION OF 2D MATERIALS**
- 3. FULLY AUTONOMOUS FLYING DRONES**
- 4. BIO-INSPIRED DRONES OF THE FUTURE**
- 5. PATENT ANALYSIS OF SHEET METAL STAMPING**

### **1. CHIP-BASED CIRCULARLY POLARIZED LIGHT DETECTOR**

Polarized light contains individual electromagnetic waves oscillating parallel to each other. The effect is created when light reflects from a transparent material. Circular polarization of an electromagnetic wave represents a type of polarization where the electric field of a passing wave changes direction in a rotary manner but does not undergo a change of strength.

Circularly polarized light is used in various optical techniques and devices and can be exploited in varied sensing applications, such as biochemical sensors. Many optically sensitive biochemical materials, such as amino acids and sugars, exhibit fingerprint anisotropic attenuation (circular dichroism) or dispersion (optical rotary dispersion) of circularly polarized light due to their intrinsic chiralities in the ultrasonic to near infrared wavelengths. Circularly polarized light has been used to sense the presence of biomolecules with chiral secondary structures via detection of the transmission optical cavity.

However, it is challenging to achieve miniature, integrated devices for detection of circularly polarized light, since the conventional optical systems for generating, analyzing, and detecting such light typically involve multiple elements. Although ultra-compact optical elements for manipulating circularly polarized light have been demonstrated, it has remained challenging to realize a highly selective, efficient circularly polarized light photodetector.

With support from the National Science Foundation, Office of Naval Research, US Army Research Office, and the Volkswagen Foundation, researchers from Vanderbilt University, under the direction of Jason Valentine, assistant professor of mechanical engineering, in collaboration with researchers at Ohio University, have developed an ultracompact circularly polarized light detector

that combines large engineered chirality, achieved using chiral plasmonic metamaterials, with hot electron injection. The device, a unique integrated circularly polarized light detector on a silicon chip, has potential in the development of tiny, portable sensors for applications, such as drug screening, surveillance, as well as imaging, emission, optical communications, and quantum computing applications.

The researchers used metamaterials to enable detection of polarized light without the need for bulk optical elements that are difficult to miniaturize. Metamaterials are engineered materials that have properties not found in nature. Such materials derive their properties from their designed structure (for example, shape, geometry, size, and orientation).

In a ray of unpolarized light, the electrical fields of the individual photons are oriented in random directions. In linearly polarized light the fields of all the photons are in the same plane. In circularly polarized light (CPL), the fields are in a plane that continuously rotates through 360 degrees. There are two types of circularly polarized light, right-handed and left-handed.

The researchers demonstrated the photodetector's ability to distinguish between left and right hand circularly polarized light without the use of additional optical elements.

In contrast to unpolarized light, circularly polarized light is able to detect the difference between right-handed and left-handed versions of molecules. Biological molecules tend to come in mirror-image pairs; this property is termed chirality. For instance, cells contain only left-handed amino acids, but metabolize only right-handed sugars.

Chirality refers to the property of asymmetry. An object or system is considered chiral when it is distinguishable from its mirror image. Chirality is a significant factor in the biological activity of drugs. For instance, one form of dopamine is effective for managing Parkinson's disease whereas the other form reduces the number of white blood cells. One form of thalidomide can ease morning sickness while the other induces birth defects. Many of the drugs under development are chiral.

Inexpensive circularly polarized light detectors have the potential for integration into the drug production process for real-time sensing of drugs. Portable detectors could be employed to determine drug chirality in hospitals or in field settings.

The metamaterial developed to absorb and detect polarized light is comprised of silver nanowires deposited in a sub-microscopic, zig-zag pattern on an ultra-thin sheet of acrylic affixed to an optically thick silver plate. The metamaterial is attached to the bottom of a silicon wafer, with the nanowire side facing upward.

The nanowires generate free-flowing electrons that produce plasmon density waves that can efficiently absorb energy from the photons passing through the silicon wafer. The absorption process creates energetic electrons that shoot up into the wafer and generate a detectable electrical current in the wafer.

The zig-zag pattern can be created to be right-handed or left-handed. When the pattern is right-handed, the surface absorbs right circularly polarized light and reflects left circularly polarized light. When it is left-handed, the surface absorbs left circularly polarized light and reflects right circularly polarized light. The sensor is able to distinguish right from left circularly polarized light by including both right-handed and left-handed surface patterns.

A member of the Vanderbilt research team noted that there have been two prior efforts to make solid-state polarized light detectors. One technique used chiral organic materials that are unstable in air, operated only in a narrow range of wavelengths, and exhibited a limited power range. The other approach was predicated on a more complicated multilayer design that only worked at low temperatures.

While the efficiency of the prototype of the circularly polarized light detector on a silicon chip is 0.2% percent, which is too low for commercial viability, the researchers have concepts for enhancing the efficiency to match that of a conventional photodetector.

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## **2. MULTI-STAGE DEPOSITION IMPROVES PRODUCTION OF 2D MATERIALS**

Graphene, and other flat, ultra-thin two dimensional materials, have the potential of positively impacting electronics and optics, similar to the way their cylindrical counterparts, carbon nanotubes have. A challenge for material scientists is to make such materials in large enough sizes for commercial applications. Researchers based at the Massachusetts Institute of Technology in

Cambridge, Massachusetts, The China University of Petroleum, Central South University in China, the National Tsing-hua University in Taiwan, and Japan's Saitama and Tohoku Universities have developed a way to make relatively large sheets of molybdenum telluride (a two-dimensional, flexible, transition metal dichalcogenide semiconductor material) that may one day enhance the performance of solar energy cells and transistors.

The multinational research team chose molybdenum telluride for their project because of its bandgap similarity to silicon, which is used in both transistors and solar cells. In single layer form, molybdenum telluride has a direct bandgap that increases light emission, and strongly absorbs solar radiation, both pluses to make more efficient solar cells.

Because molybdenum telluride exists in metallic form, it has good electrical conductivity. As a natural semiconductor, the material is highly suitable for use in electronic devices. The US/China/Japan team controlled the synthesis of the material to obtain the needed form for particular applications in research that was supported by the National Science Foundation, the Office of Naval Research, and the International Postdoctoral Exchange Fellowship Program.

The team used chemical vapor deposition in their process. Known as CVD by the semiconductor industry, which uses it to produce thin films, the process typically involves exposing a wafer substrate to one or multiple volatile precursors in a chamber. The latter react and decompose to create required deposits on the substrate, with any unwanted volatiles removed from the reactive chamber.

The university scientists used CVD to make sheets of molybdenum telluride of varying thickness to the size of the CVD chamber itself. A barrier the team had to address was the low tendency of the two precursor materials—molybdenum and tellurium—to form molybdenum telluride. This was caused by the weak atomic bonds in the semiconductor material.

The researchers achieved this by dividing their CVD process into several stages that began with applying a layer of elementally pure molybdenum. The scientists then oxidized that layer, removed it, and added tellurium in powdered form. They vaporized the latter in a carrier gas of argon and hydrogen heated to 700 degrees Celsius to produce a uniform molybdenum telluride film that the scientists directly incorporated into field effect transistors in the laboratory. Another potential application for molybdenum telluride would be in spintronics,

the emerging use of spun electrons, instead of their charge, as in done in standard electronic devices.

The team reported growing molybdenum telluride sheets with a very large area that are homogeneous, and possess high quality. The next steps for the academic scientists will be to investigate using their multi-stage CVD process to form large two-dimensional sheets of other thin film materials with potentially significant benefit.

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### **3. FULLY AUTONOMOUS FLYING DRONES**

Drones or unmanned aerial vehicles are developed by fusing different technologies together such as computer vision, aerial precision robotics, artificial intelligence. With the help of such technologies, drones are able to navigate semi-autonomously. Businesses and governments have identified various applications of drones. For warfare, surveillance, and inspection of structures and so on, there is a demand for fully autonomous drones which can be operated without pilots. There are certain challenges associated with autonomous drones in the outside environment, such as limited computational processing capabilities, improper or weak GPS signals to navigate and heavy wind currents, which can provide inaccurate data for autonomous flights. There is a need for autonomous flying drones which can navigate accurately with high efficiency.

To address the above challenges, José Martínez Carranza from INAOE, National Institute of Astrophysics, Optics and Electronics in Mexico has developed fully autonomous drones which can identify new routes without depending on GPS signals or trained personnel. With the help of low-cost sensors, such as gyroscopes, accelerometers, camcorders and so on, the researcher has replaced GPS systems. They have developed an innovative method to deduce the position and orientation of the vehicle and provide a learning system and vision to navigate the drones.

The accelerometer will help to measure the acceleration of the autonomous drone and speed at which it is travelling. Gyroscopes will help the autonomous drones determine the orientation of the system. Camcorders and imaging sensors will help to capture the visual information and the autonomous drone will recognize the environment in which it is positioned.

The researcher at INAOE employed an algorithm from the PUCE (Precise navigation of UAVs in Complex Environments and SMART Boomerang) project, which considered data from various sensor inputs to perform the autonomous flight of the drone. In addition, resat software for the ground control station was developed at INAOE. At the ground control station, the visual transmission from the drone will be received in real time to take further action on the issue.

The autonomously flying drone will enable various civil applications, such as general surveillance, perimeter security, border security, traffic management, power line monitoring, filming, warehouse, package delivery and so on.

Research in the area of aerial robotics which facilitated development of the autonomous drone was supported by Royal Society-Newton Advanced Fellowship financing awarded by the British Academy of Sciences.

The development of autonomous flights was enhanced through the Robust Autonomous Flight of unmanned Aerial vehicle in GPS-denied outdoor areas (RAFAGA) project, which has aimed to investigate methods to conduct flights of autonomous drones in environments with challenges such as wind currents in areas without a GPS signal and with limited computational processing capabilities. The RAFAGA project was achieved through the support of the Newton Fund. Funding concludes in the first quarter of 2017.

The INAOE researcher has demonstrated a system prototype of autonomous flying drones independent of a GPS in the operational environment. The researcher plans to operate the drone with the help of wearable devices.

The landscape of commercial drones in the future is expected to be crowded. The variety of technologies used for drones will continue to cater to diverse customers. The ability of the sensing components to open up several applications will have a significant impact in this regard. In the next few years, the global market is expected to see the introduction of commercial drones. Countries such as the US and Europe will carefully open their skies for drones with appropriate legislations in the next few years. With limited standardization policies, countries such as China are expected to face many challenges in terms

of commercializing drones. Additionally, with reduced cost of components and convergence of technology with three-dimensional (3D) printing, increased production is expected and time to market will be shortened considerably. The above-mentioned factors create opportunities to unleash a new wave of entrepreneurship and innovation.

The total estimated commercialization time can be deduced with the help of the technology readiness level. At present, the autonomous drone flying technology from INAOE is at level seven and it is expected to be commercialized in approximately three years' time.

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#### **4. BIO-INSPIRED DRONES OF THE FUTURE**

Research involving the mimicry of biological systems, called biomimetics, seeks to leverage designs from nature to enable, design and develop new man-made materials and structures. For example, nature has produced extraordinary sensory systems in biological species that exceed the capabilities of a wide range of man-made sensors. Understanding the physical, chemical, and biological processes that are responsible for these sensory capabilities may produce a blueprint for replicating or reconstructing them in man-made devices. Bio-inspired materials are products of a natural outcome of a biological activity, such as the human nervous system. Such technology can lead to expandable networks carrying multiple types of sensors to be deployed and integrated into structures. Diverse multi-scale processing techniques are used to manufacture bio-inspired intelligent material. The material can be fabricated using complementary metal-oxide semiconductor (CMOS) and microelectromechanical systems (MEMS) processing on polymer substrates using piezoceramic materials. Bio inspired materials are gaining traction among OEMs, research laboratories, and academic institutions that are working toward developing intelligent materials. Furthermore, bio replication, the reproduction of natural devices, is emerging as certain researchers seek to reproduce structural colors by directly replicating the iridescent wings of butterflies.



Exemplifying opportunities for bio-inspired devices, researchers from Stanford University along with support from other Universities and research institutions, such as the University of North Carolina at Chapel Hill, Harvard University, University of California and The Johns Hopkins University, are working together to enable drones inspired by nature. Stanford University has successfully used bio-inspired material for large passenger aircraft, but it has been difficult to implement the same technology on a smaller scale, for instance, in drones.

To enable flight control, researchers are taking cues from flying animals, such as scavenging pigeons and alcohol sniffing fruit flies. They are developing bio-inspired solutions to improve the landing and takeoff capabilities of drones and are also focusing on obstacle avoidance, swarming, and in-flight grasping. To identify objects and avoid collisions in the environment that is complex and cluttered, stereovision provides a solution, helping to measure the estimated distance of objects.

The researchers are studying the hawk moth to address the strong wind and whirlwind challenges for drones. Insights on the hawk moth's flight control in strong winds will help researchers to design and assess the robustness of the drones with respect to environmental turbulence. In addition, the researchers are also working towards flying the drone above the ground with stable speed and picking up samples to be delivered elsewhere. The researchers are taking a cue from eagles, which grasp objects with high precision and speed. In addition, the researchers are also developing a special algorithm with reference to animal behavior.

Bio-inspired small flying robots are expected to influence the daily lives of people. There is huge scope for application of bio-inspired drones in courier services, military surveillance, and in the near future, flying camera phones. It is anticipated that bio-inspired drones will someday end up on everyone's doorstep.

The researchers have formulated the technology concept and are currently working on developing the experimental proof of concept for smaller drones. They have completed the system prototype for large commercial flights and demonstrated it in the operational environment. It is expected that bio-inspired system prototypes of drones will be developed and demonstrated in the operational environment in two to three years' time. Once the actual system is proven in the operational environment, it is expected to get a positive response from the defense sector.

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## **5. PATENT ANALYSIS OF SHEET METAL STAMPING**

Sheet metal stamping is a process in which a flat sheet of metal--either in the form of a coil or a blank--is sent into the stamping press machine consisting of a tool and a die surface to press the sheet metal into a shape according to the attached die. This process is used in major industries, such as automotive, aerospace and defense, for producing child or blank parts, which will be assembled to form a larger component. The stamping machine can produce many parts according to its capacity in one stroke. This process provides a lower cost per product, less scrap material, and also enables manufacturers to produce more parts in a shorter time period.

From the patent analysis on sheet metal stamping, it appears that a comparatively high number of patents are filed in China; although major automotive companies such as DAIMLER (Germany) and VOLKSWAGEN AG (Germany) have filed patents related to sheet metal stamping. Most of the patents filed are based on surface treatment processes, fixtures, and sheet metal stamping methods. Patent (CN104498168) filed by Wuhu Huajin Punching Processing Parts Factory (China) pertains to a new water-based lubricant for sheet metal stamping. The lubricant has a good anti-rust performance and mainly consists of sodium pyrophosphate, sodium polyacrylate, dipotassium hydrogen phosphate, and so on. Similarly patent (CN 104444396), filled by Guangxi University (China), pertains to a separation device for stacking and detaching the stamped sheet metal using driving, pushing, lifting, and separating mechanisms and a sheet metal supporting base.

## Advanced Manufacturing Technology Alert

Title	Publication Date/ Publication Number	Assignee	Inventor	Abstract
Metal plate stamping method and stamping apparatus	Sept 24, 2015/ US 20150266078	Toyota Boshoku Kabushiki Kaisha	Kazuyuki Hirata	A metal plate stamping method is provided for cutting a metal plate, on which a bulging portion is formed through stamping, at a cutting area that is defined in a portion other than the bulging portion. The method includes forming a bead on the opposite side of the cutting area from the bulging portion and crushing the bead prior to the cutting of the metal plate.
Surface treatment process of metal stamped parts	April 22, 2015/ CN 104532222	Changshu Hongfu Plastic Metal Product Co. Ltd.	Lu Xuehong	The invention discloses a surface treatment process of metal stamped parts. The surface treatment process comprises the following steps: 1) mixing 21 parts by mass of acetic acid, 6 parts by mass of zinc nitrate, 3 parts by mass of polyoxyethylene stearate, 1 part by mass of nickel nitrate, 1 part by mass of sodium hydrogen fluoride, 3 parts by mass of phytic acid and 2.7 parts by mass of N-methyl pyrrolidone, and reacting for 3.5 hours at 113 DEG C to prepare a metal surface treatment agent; 2) mixing 25 parts by mass of a metal surface treatment agent with 163 parts by mass of water to prepare a surface treatment working liquid; 3) heating the surface treatment working liquid to 55 DEG C, and placing the metal stamped parts in the surface treatment working liquid for 28 minutes. The surface treatment process of the metal stamped parts disclosed by the invention is capable of improving the anti-oxidation and anti-corrosion capacities of the metal stamped parts.
Metal plate stamping fixture	April 08, 2015/ CN 104498168	Wuhu Huajin Punching Processing Parts Factory	Wang Xianjin	The invention discloses a water-based lubricant for metal stamping, belonging to the technical field of a lubricant for metal stamping. The water-based lubricant for metal stamping comprises the following components: polyethylene glycol, sodium polyacrylate, fatty acid amide, guar gum, sodium pyrophosphate, silica sol, polyacrylamide, dipotassium hydrogen phosphate, naphthalene sulfonate and water. According to the water-based lubricant for metal stamping and through the creative component proportion, the lubricant has good anti-rust performance while the good lubrication can be guaranteed; and in addition, the lubricant is convenient to clean, not only the cleaning labor intensity be greatly reduced, but also a workpiece has favorable smooth finish.
Metal plate stamping fixture	April 01, 2015/ CN 104498168	Chongqing Haishan Rubber and Plastic Chemical Co. Ltd.	Zhong Shihai	The invention discloses a metal plate stamping fixture which comprises a base plate and a stamping die plate fixed on the base plate, wherein at least three die holes are formed in the stamping die plate along the longitudinal direction; guide columns are also arranged on the base plate; pressing plates which are in sliding fit with the guide columns are arranged on the guide columns; stamping heads matched with the die holes are arranged on the pressing plates; material falling holes opposite to the die holes are also formed in the base plate; longitudinal through slots are formed below the material falling holes; material receiving baskets are arranged in the longitudinal through slots. According to the metal plate stamping fixture, a plurality of die holes are formed in the stamping die plate, so that a plurality of products can be obtained by one-step stamping; furthermore, the stamped products directly fall into the material receiving baskets, and material discharging is facilitated, so that the production efficiency of a die is high; moreover, by the arrangement of guide rolling shafts, raw material steel plates can be guided, so that the positions between the steel plates and the die holes can be better matched, products with high quality can be stamped, and product defects caused by steel plate staggering are avoided.
Surface treatment process for radiator shell metal stamping piece	March 25, 2015/ CN 104451642	Changshu Hongfu Plastic Metal Product Co. Ltd.	Lu Xuehong	The invention discloses a surface treatment process for a radiator shell metal stamping piece. The surface treatment process comprises the following steps: 1) mixing 15 parts by mass of benzoic acid, 8 parts by mass of polyoxyethylene sorbitan fatty acid ester, 2 parts by mass of sodium molybdate, 4 parts by mass of nickel nitrate, 4 parts by mass of sodium hydrogen fluoride, 2 parts by mass of phytic acid and 3.6 parts by mass of hydroxypropyl methyl cellulose, and reacting for 3.5 hours at 110 DEG C to obtain a metal surface treatment agent; 2) mixing 13 parts by mass of metal surface treatment agent and 96 parts by mass of water to obtain a surface treatment working solution; and 3) heating the surface treatment working solution to 50 DEG C, and putting the metal stamping piece into the surface treatment working solution for 25 minutes. The surface treatment process for the radiator shell metal stamping piece can improve the oxidation resistance and corrosion resistance of the metal stamping piece.

Title	Publication Date/ Publication Number	Assignee	Inventor	Abstract
Separation device for detaching and stacking stamped sheet metal	March 25, 2015/ CN 104444396	Guangxi University	Xia Wei	A separation device for detaching and stacking stamped sheet metal comprises a driving mechanism, a pushing mechanism, a lifting mechanism, a separating mechanism and a sheet metal supporting base. The sheet metal supporting base is used for supporting the other mechanisms and stacking the sheet metal. The pushing mechanism allows a pushing assembly to slide linearly in the horizontal guide direction of a guide support through a vertical slide rod connected with a cylinder so that the effect of pushing out the sheet metal on the top layer can be achieved. The lifting mechanism controls the guide support to rise and fall by adjusting the number of rotation circles of a screw so that a push block can always keep aligned with the sheet metal on the top layer when starting to work. The separating mechanism is connected to the lifting mechanism when a steel wire rope is wound around a pulley so that the separating mechanism can synchronously rise and fall together with the lifting mechanism under the influences of the gravity of the separating mechanism. A separating rod can prevent the sheet metal on the top layer from absorbing the sheet metal on the lower layer and sliding together with the sheet metal on the top layer, and a separating inclined block makes a gap formed between the sheet metal on the top layer and a sheet metal stack. The intermittent movement of the pushing mechanism and the lifting mechanism is achieved through double ratchets by means of the driving device. The separation device is easy to operate, high in efficiency, good in separation effect, high in flexibility and wide in applicability.
Mechanical metal steel stamp marking machine and production method thereof	March 25, 2015/ CN 104438454	MCCS Group Corporation Limited (Shanghai)	Liu Zhihui	The invention relates to a mechanical metal steel stamp marking machine, which comprises a rotation disk seat frame, a pressure hammering mechanism and a steel stamp, and is characterized in that the rotation disk seat frame comprises a bracket (1), a rotation disk vertical rod (13) and a steel platform (10), the bracket (1) and the steel platform (10) are vertically and fixedly connected, the rotation disk vertical rod (13) is parallel to the bracket (1) and is arranged above the steel platform (10) in a suspending manner, the pressure hammering mechanism comprises a pressure machine (12), the pressure machine is an electric pressure machine, the pressure machine punch (11) of the electric pressure machine is arranged on the front end of the pressure machine (12) and is arranged above a rotation disk (7), the steel stamp comprises a plurality of Type blocks, and the Type blocks are character blocks, or English letter blocks, or number blocks. The mechanical metal steel stamp marking machine of the present invention has advantages of simple structure, easy production, low cost and good marking quality.
Heat treatment device for metal stamping workpiece	March 25, 2015/ CN 104451050	Tianjin Jianfa Precision Machinery Manufacturing Co. Ltd.	Wang Li	A heat treatment device for metal stamping workpieces is used for metal heat treatment. The device comprises a furnace body; a roller bottom track is disposed at the bottom of the furnace body; the device also comprises a fuel gas conveyer pipe which is provided with a regulating valve and is connected with a plurality of nozzles disposed in the furnace body; the device further comprises a temperature controlling device connected with the furnace body. The temperature controlling device comprises a temperature sensor, a PLC controller, and a thermocouple; the thermocouple is disposed in the furnace body, and is connected with the temperature sensor; the PLC controller is connected with the temperature sensor and the regulating valve. The effect is that: with the mounted thermocouple feedback device, an actually measured value of the thermocouple in a temperature control zone is sent to the PLC controller through the linearized temperature sensor, and the PLC controller adjusts the heating quantity through controlling of the regulating valve.

Title	Publication Date/ Publication Number	Assignee	Inventor	Abstract
Shell metal part surface treatment technique	March 11, 2015/ CN 104404491	Changshu Hongfu Plastic Metal Product Co. Ltd.	Lu Xuehong	The invention discloses a shell metal stamping part surface treatment technique which comprises the following steps: 1) mixing 65 parts by mass of ethanedioic acid, 7 parts by mass of zinc nitrate, 5 parts by mass of sodium molybdate, 2.3 parts by mass of nickel nitrate, 2 parts by mass of coconut diethanol amide, 3 parts by mass of phytic acid and 2 parts by mass of dodecyl trimethyl ammonium sulfate, and reacting at 115 DEG C for 3 hours to obtain a metal surface treating agent; 2) mixing 17 parts by mass of metal surface treating agent and 136 parts by mass of water to obtain a surface treatment working fluid; and 3) heating the surface treatment working fluid to 54 DEG C, and putting the metal stamping part in the surface treatment working fluid to perform surface treatment for 27 minutes. The surface treatment technique can enhance the oxidation resistance and corrosion resistance of the metal stamping part.
Shell metal part surface treatment technique	March 11, 2015/ CN 104404491	Changshu Hongfu Plastic Metal Product Co. Ltd.	Lu Xuehong	The invention discloses a shell metal stamping part surface treatment technique which comprises the following steps: 1) mixing 65 parts by mass of ethanedioic acid, 7 parts by mass of zinc nitrate, 5 parts by mass of sodium molybdate, 2.3 parts by mass of nickel nitrate, 2 parts by mass of coconut diethanol amide, 3 parts by mass of phytic acid and 2 parts by mass of dodecyl trimethyl ammonium sulfate, and reacting at 115 DEG C for 3 hours to obtain a metal surface treating agent; 2) mixing 17 parts by mass of metal surface treating agent and 136 parts by mass of water to obtain a surface treatment working fluid; and 3) heating the surface treatment working fluid to 54 DEG C, and putting the metal stamping part in the surface treatment working fluid to perform surface treatment for 27 minutes. The surface treatment technique can enhance the oxidation resistance and corrosion resistance of the metal stamping part.
Sheet metal part stamping device and application method thereof	Dec 03, 2014/ CN 104174754	Chengdu Xingboda Precision Machinery Co. Ltd.	Wu Guangwu	The invention discloses a sheet metal part stamping device and an application method thereof. An adjusting cylinder penetrates through an upper mould seat and is placed in a through hole; a stamping head is arranged in the adjusting cylinder in a sliding manner; a fixing ring is mounted on the inner wall of the adjusting cylinder; a plurality of trapezoid grooves are formed in the fixing ring and are radiated in the radial direction of the fixing ring; stop dogs are arranged on the trapezoid grooves; a bulge is connected with the lower part of each stop dog; each bulge is arranged in the corresponding trapezoid groove in a sliding manner; each stop dog is connected with the adjusting cylinder wall through a torsion spring; during the operation, the torsion springs are kept at a compression state.
Sheet metal part stamping device	July 09, 2014/ CN 103909136	Chengdu Hailingda Machinery Co. Ltd.	Chen Zhiqiang	The invention discloses a sheet metal part stamping device which comprises an upper die base and a lower die base. The upper die base is connected with the lower die base through a supporting rod, the lower die base is arranged on a working table of a stamping machine, a stamping head is arranged in the upper die base, a rubber block is arranged between an annular plate and a lower die fixing plate, and is arranged inside an annular ring formed by a plurality of screw rods, a sunken portion is formed in the middle of the rubber block, and is concentric with an inner hole of the annular plate, an upper surface of a stress plate and the upper surface of the annular plate are arranged on the same horizontal plane, an adjusting cylinder penetrates through the upper die base and is arranged in the through hole, the stamping head is arranged in the adjusting cylinder in a sliding mode, a fixing ring is arranged on the inner wall of the adjusting cylinder, a plurality of trapezoid-shaped grooves are formed in the fixing ring, the trapezoid-shaped grooves are radiated in the radial direction of the fixing ring, a baffle block is arranged on the trapezoid-shaped grooves, protrusions are connected with the lower portion of the baffle block, the protrusions are arranged in the trapezoid-shaped grooves in a sliding mode, the baffle block is connected with the wall of the adjusting cylinder through a torsion spring, and in the working process, the torsion spring is in the compression state.

### Exhibit 1 depicts patents for sheet metal stamping.

Picture Credit: Frost & Sullivan

**Back to TOC**

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