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LASER ENGRAVING

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Abstract: The complex equipment known as the laser engraver uses laser technology to precisely etch intricate designs onto a variety of materials. It provides flexibility for customized creations on materials including wood, metal, plastic, and glass and is operated by computer software. Because of its accuracy, it's a popular option for creating customized products, signs, and creative projects that combine technology with creativity in a seamless way.

Keywords: Laser module ,Slider x3,Power supply ,CNC shield v3,Arduino uno,A4988 Driver x2

Introduction:

A laser engraver is a precision tool that etch or engraves designs onto a variety of materials, including glass, metal, plastic, and wood, using a laser beam. This technology is popular for artistic crafts, signage, and personalized objects because it can achieve great precision and fine detailing. Computer software governs the laser engraving process, providing freedom and personalization in the creation of intricate patterns, text, or images on a variety of surfaces.

Literature survey:

Mr. Sachin Patel (2020) has been discovered the influence of process parameters like laser power ,scanning depth, laser frequency on material removal rate, surface roughness & Engraving depth by experimentally. In these paper author describes many types of laser like carbon dioxide (CO2) laser and neodymium – dopes yttrium Aluminum garnet laser, semiconductor laser, fiber laser which are used for lase engraving process. The author recently performs laser engraving of stainless steel 316. Material is removed by lase process called as laser engraving machining process.

Georgi M. Martinov published paper on an approach to building specialized CNC system for Laser Engraving machining. This paper describes the main problem for material processing with impulse laser emission is necessary to maintain impulse frequency in fixed interval .The traditional control method with impulse confirmation waiting

could be realized in any NC system .The experiment shows that the developed approach allows to greatly increase the processing speed compared to the method with impulse confirmation waiting .Hence the increases the 30-50% is achieved.

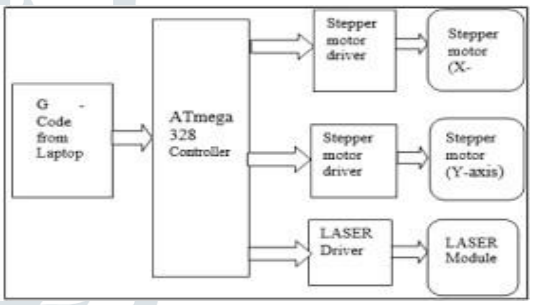
Alexander Stepanov gives an idea of engraving of paper by using laser. The laser is useful in processing of paper materials was discussed in paper. It discovered that laser is useful to engrave on all natural wood-fiber based materials. Nowadays due to development of laser engraving (especially development of CO2 technology) which is less costly, laser engraving on paper material has started to become more widely used. It is more efficient. There, some reviews on research paper were discussed.

Yusoff discovered the marking of Integrated circuit (IC) packages with neodymium-doped yttrium aluminum garnet lasers. It has become widely accepted technique in the microelectronics industry. The author also presents discussion and literature review of various methods. He describes the mechanism of laser marking of plastics and ceramics IC packages. The effect of materials properties such as absorptivity and the melting point on the mark legibility characteristics are reviewed. He describes the effect of the marking parameters such as power, density, focal position and marking speed on the mark legibility characteristics are reviewed .Mark legibility characteristics are the mark contrast and the mark width. Here also the limitations and advantages of marking of IC packages are discussed. and engraving of tilted and curved surface. This paper describes that Industry Laser Engraver is used to engrave on horizontal 2D surfaces but here we can engrave on curved inclines surface with 3D dimensional laser measurement system. Here we used same laser source and optics which is used in other engraver with some additional hardware components. There are two types of laser regime is used-1) Low power CW laser regime is used to measure the 3D shape of work piece surface 2) High peak powered Laser regime is used for processing. By using low power laser regime we get the projection of our work piece shape so need to exact positioning or orientation of our work piece before processing as automatic projection of work piece takes place. This paper demonstrates the 2D and 3D laser engraving method with its advantages and disadvantages. This method is applied for engrave on curved and flexible Here with the help egg example the whole process is explained. For beam movement in X and Y direction , Galvo motors and a linear translator for positioning the work piece along the Zaxis is used .The measurement of work piece is takes place within 10 sec. Here custom software is developed which measure and then project the laser can beam according to input.

Proposed system:

A laser engraver system typically consists of a laser source, control electronics, and a motion system. Users input designs through software, controlling laser movement for precise engraving on various materials. Safety measures, ventilation, and power control are crucial aspects. Specifics depend on your requirements, like power, bed size, and material compatibility. Includes a laser source, control electronics, and motion system. Users input designs via software for precise material engraving. Safety measures, ventilation, and power control are vital, with system specifications tailored to specific need.

Block Diagram:



Laser engraving is used to engrave a specific image or trademark onto a chosen material. It's a subtractive technique of production. However, before the engraving process can begin, a file from a computer must be transferred to the machine's controller, which then sets the laser. When the Laser Engraving process begins, the beam generates a large amount of heat, which burns or evaporates the surface in accordance with the picture in the file. There are two types of engraving: line engraving and surface engraving. The first employs vector pictures to follow routes or lines, while the second vapourises the material to embed an image or give the design a threedimensional appearance. For Laser Engraving, Any 3D files, such as. stl, cannot be read by laser engraving devices. As a result, you must utilise 2D file formats such as jpg, pdf, png, or ai. The file's model will be turned into dots, and the distance between them will define the depth of the engraving.

STEPS FOR WORKING: The CNC is constructed in four stages:

(a) convert the selected image into G-code.

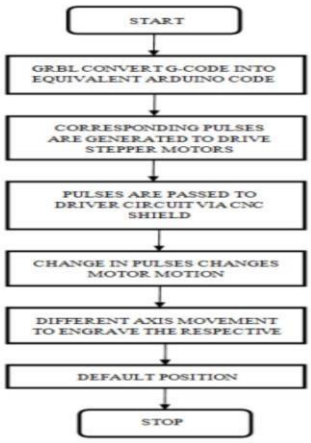
(b) Programming the Arduino for CNC

operation

(c) design the shapes to be cut on interface using InkScape software.

(d) design the machine setup to start the engraving operation.

Flow Chart:



Applications:

Art and Creativity: Enabling artists to create intricate designs, sculptures, or artwork on various materials. • Aerospace and Automotive: Marking parts with serial numbers or barcodes for tracking and quality control. • Personalization: Engraving names, messages, or images on items like jewlery, gifts, and awards.

- Marking and Branding: Adding logos, serial numbers, or branding on products made from metal, plastic, or glass.
- Woodworking : Creating detailed designs, patterns, or text on wooden surfaces for artistic or functional purposes.

Conclusion:

In conclusion, the laser engraver project showcases the intersection of precision technology and creative expression. Through meticulous design and implementation, the device demonstrates its versatility in engraving various materials with intricate details. This project not only hones technical skills but also opens doors to personalized craftsmanship, making it a valuable addition to both the maker community and industries seeking advanced engraving solutions.

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