iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** III **Month of publication:** March 2021

DOI: https://doi.org/10.22214/ijraset.2021.33521

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com

360 Degree Flexible Drilling Machine

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Abstract: ***Drilling is the most common operation in the metal industries. Drilling machines are used for drilling, Rimming, Boring, etc. operations. Drilling operations are done for drilling holes in parts, sheets and structures. Perfect and well aligned drilling operations are most preferred in the industries. So here we propose a 360 degree flexible drilling machine that can be easily mounted on table or walls or on inclined surfaces. It helps to drill holes in horizontal, vertical and inclined surfaces of the parts without changing the position of the parts. It can also be used for upside down working positions. This makes easy to drill holes on any kind of surfaces and in any direction. We have uses three arm structure of different lengths which are connected to each other by with rotating hinges and connectors. They are mounted on base plate which is easy to mount or fix on any surface to carryout drilling operation. Third arm contains pneumatic piston cylinder which is connected with the motor. Pneumatic piston provides linear motion to motor to provide required pressure and depth for the drilling operation. The structure was made by stainless steel. Because of that it poses light weight and anti-corrosion property. It is also easy to assemble and disassemble and carry from one place to another. We can use this kind of structures for other machines to reduce their weights and making them more efficient by increase their working is. This may reduce working time and machine setup cost and also increases productivity and quality of product.***

Keywords: Pneumatic Cylinder, Drilling Tool, Clamps, Kerbs, Hinges, Drilling Machine, Motor 24V, Grinding, Cutting Machine, Marking

I. INTRODUCTION

A useful for boring operations. There are many type of drilling machines like hand drill, horizontal drilling machines, vertical drilling machine etc. Drilling machines are of small to large size as per work requirement. Drilling machines are fixed on table or on solid surface. Drilling machines are heavy in construction Drilling machines are most commonly used in industries. Drilling machines are mainly used to drill holes in any work pieces, sheets, sections etc. Drilling machines are also used for home purpose. Drilling machines are also and they require more setup space. Drilling machines are easy to operate. But for larger components large sized drilling machines are required or hand drills are used for drilling holes. Drill bits are used as cutting tool in drilling machines. Drill bits are available in many sizes as per hole size required. Drilling machine is such a heart of any industry, because without this machine drilling operations are very difficult to carry out.

Drills are available with a wide variety of performance characteristics, such as power and capacity. Drill machines have been the heart of every industry. Drilling holes in parts, sheets and structures is a regular industrial work. Perfect and well aligned drilling needs fixed and strong drills. Some parts cannot be drilled using fixed drills due to low space between drill bit and drill bed. We need to use hand drills in such cases but hand drills have alignment problems while drilling. So here we propose a 360 degree flexible drill that can be mounted on a table or wall and can be used to drill holes horizontally, vertically or even upside down. So this makes it possible for easy drilling in even complicated parts and surfaces. Thus we use rotating hinges and connectors with motor mount and supporting structure to design and fabricate a mini 360 degree drill for easy drilling operations.

A. Advantages of Drilling Machine

Price will be much cheaper as compared to other available in market, the presently available smallest radial drilling machine will cost approximately 1.5 lakes but this machine costs only 40000 rupees.

While drilling, complex drills can be achieved with high accuracy.

1) It is a multifunctional portable machine.
2) The sixth degree of freedom is an added advantage of using this machine.
3) Helping the needy small scale industries had been our main goal and we have succeeded in providing a simple solution which has a huge scope to be improvised in the near future.
4) The machine design with furthermore up gradation is a new step towards evolution of drilling machine, and would compete the presently available model.

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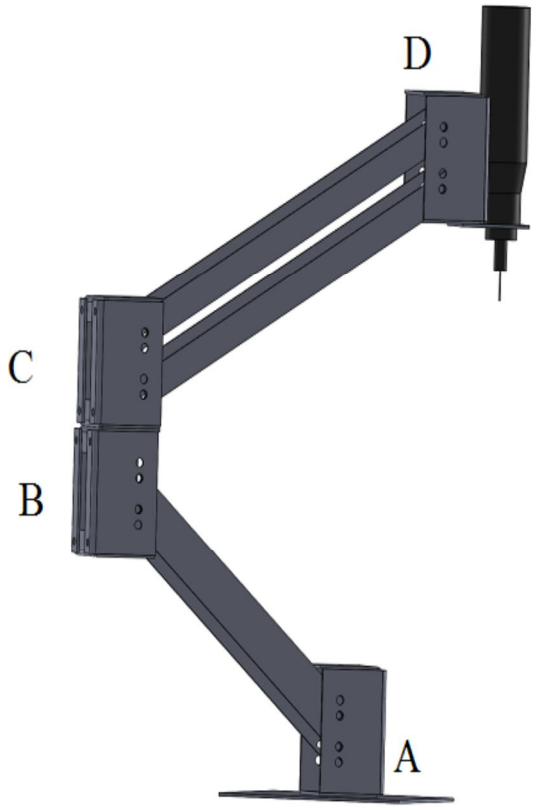
B. Disadvantages of Drilling Machine

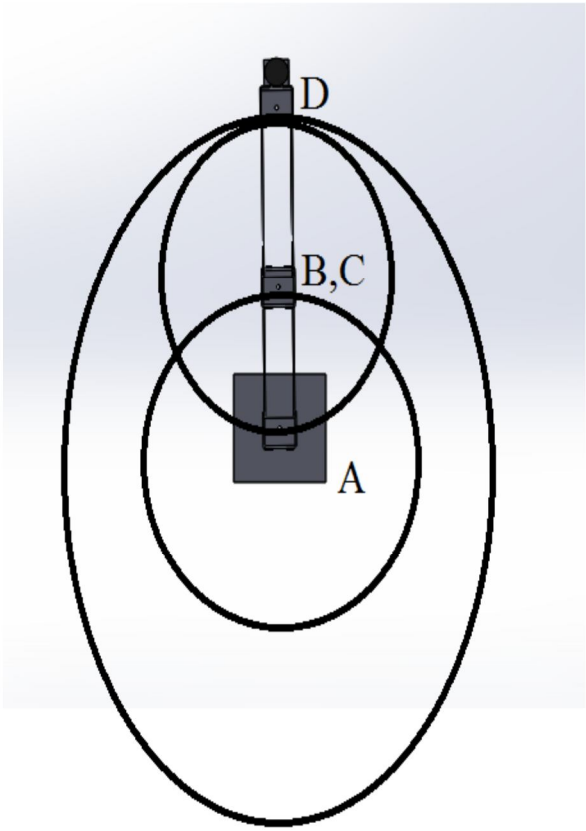
1) Drilling manually, which is time consuming process and is a hectic job.
2) Drilling machine available in market is costly and small scale companies cannot afford it.
3) In a radial arm drilling machine can only rotate up to 270 deg. about its base.
4) Work part should always be smaller than its work table form it perform the drilling operation.
5) It is less portable because of being very heavy.
6) Cost of machine is high.
7) Maintenance of machine is also high.
8) Difficult for the small scale companies to afford the costlier machines.

II. WORKING PRINCIPLE

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The drill bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. The cutting edge was forced against the work piece, to cut off chips from the hole as it is drilled.

The working operation of this 360 degree flexible drilling machine is based on robotic arm used for painting of car bodies in automobile companies. The structure of this machine is flexible to move in all direction upto 360 degree angle. This machine structure has three arms. Each arm has its individual movement. Each arm has four metal strips of 25 X 2 X 400 mm Dimensions which are made of SS (Stainless Steel 304). The SS strips are attached with clamping box which is also made of SS (304) material at both ends by using nut and bolts. The first arm is fixed on base plate (6 X 300) mm which is made of MS (Mild Steel) by using nut and bolt. The second arm mounted at the top end of first arm and third arm is mounted at the side end of second arm. Third arm contains the motor at its end. All three arms have rotational and linear movements. As per the requirement of drilling hole size and angle of drilling we have to set the position of all three arms and two arms are need to fix to lock the position of drill. Then the drilling motor started by providing power supply. The pressure required for drilling the hole is given by the pneumatic cylinder. With the help our project we can achieve the angular and simple drill holes very precisely.





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III. REVIEW OF LITERATURE

A. R. Anandhan, P. Gunasekaran, D. Sreenevasan, D. Rajamaruthu

Design and Fabrication of Angular Drilling Machine. The basic parts of a drilling machine are a base, column, drill head and spindle. The base made of cast iron may rest on a bench, pedestal or floor depending upon the design. Larger and heavy duty machines are grounded on the floor. The column is mounted vertically upon the base. It is accurately machined and the table can be moved up and down on it. The drill spindle, an electric motor and the mechanism meant for driving the spindle at different speeds are mounted on the top of the column. Power is transmitted from the electric motor to the spindle.

B. Arvind Kumar, Maughal Ahmed Ali Baig and Ravindra Lathe

Automation of a Drilling Machine using Pneumatic Devices

This paper presents an automation methodology involving Pneumatic systems to convert the existing conventional drilling machines into automated drilling machines. The automation process involves various pneumatic devices, pneumatic systems and also some electrical and electronic devices. The automation strategy, when implanted is believed to result in reduced cycle time, costs, improved product quality and increase in productivity. By considering a particular task of drilling holes, it is found from the present investigation that by the process of conversion the output rate increases four times as compared to that of conventional type of machines.

C. Gautam Jodh, Piyus hSirsat, Nagnath Kakde, Sandeep Lutade

Design of low Cost CNC Drilling Machine

A drilling machine is a device for making holes in components. The manually operated type of drilling machine creates problems such as low accuracy, high setup time, low productivity, etc. A CNC machine overcomes all these problems but the main disadvantage of a CNC drilling machine is the high initial cost and requirement of skilled labor for operating the machine. Hence, there arises a need for a low cost CNC machine which can not only drill holes with high accuracy and low machining time but also have low initial cost. The need for skilled operator is eliminated by providing software with a more user friendly graphical user interface.

D. J. Pradeep Kumar, P. Packiaraj

Effect Of Drilling Parameters On Surface Roughness, Tool Wear, Material Removal Rate And Hole Diameter Error In Drilling

The aim of this work is to utilize taguchi method to investigate the effects of drilling parameters such as cutting speed (5,6.5, 8 m/min), feed (0.15, 0.20, 0.25mm/rev) and drill tool diameter (10, 12, 15mm) on surface roughness, tool wear by weight, material removal rate and hole diameter error in drilling of OHNS material using HSS spiral drill. Orthogonal arrays of taguchi, the Signal–to- Noise (S/N) ratio, the analysis of variance (ANOVA), and regression analysis are employed to analyze the effect of drilling parameters on the quality of drilled holes. A series of experiments based on L18 orthogonal array are conducted using DECKEL MAHO-DMC 835V machining center .The experimental results are collected and analyzed using commercial software package MINITAB 13. Linear regression equations are developed with an objective to establish a correlation between the selected drilling parameters with the quality characteristics of the drilled holes. The predicted values are compared with experimental data and are found to be in good agreement.

E. K. Vengatesvaran, R. Rathish, M. Kanagaraj, M. Sivakumar , S.Kannan , G. Vijayakumar

Solar Powered Drilling Machine

This project is provided to familiarize ours about the technology on drilling a metal which is used pneumatic concept yet has rapidly grown especially in the automotive and electrical industry. Furthermore, the strong concern is to obtain better product quality with lower cost. Then, drilling is important processes in the metal industry; the former is flexible in processing whilst the latter is effective in production. To combine the advantages of both, the so-called combination machines that combine the drilling processes are used in metal processing. Using pneumatic systems is economical and environmentally friendly, as air is inexpensive, plentiful and easily compressed and stored in tanks on other hand quality and productivity play important role in today's manufacturing market. Now a day's due to very stiff and cut throat competitive market condition in manufacturing industries. The main objective of industries reveal with producing better quality product at minimum cost and increase productivity. Let, we briefly explain about our new project carried out in drilling choose from referring a various research and development of drilling process in earlier days to current trend process. And also to explain about our project experimental procedures, results

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F. Kermit H. Cooper

Multiple Drilling Machine

This invention relates to drilling machines, and more particularly to automatic pattern drilling machines. The primary object of the invention is to generally improve such drilling machines. The present machine is well suited for but is not limited to the drilling of printed circuit 'boards. These require small holes at small spacing, and the pattern therefore is preferably a full size pattern, more specifically a perforated insulation sheet adhered to a metal contact plate which is coextensive with the table of the machine. In accordance with one object of the invention, the work table and contact plate are stationary, the drill carriage being movable over the table with a scanning motion. A further object is to conserve space while keeping both the table and contact plate readily accessible, and for this purpose the table is disposed horizontally and the contact plate is disposed vertically at one side of the frame supporting the table.

G. Dhanraj Patel and Rajesh Verma

Analysis Of Drilling Tool Life

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips (swarf) from the hole as it is drilled. Here we are analyzing the drilling tool life, which showed us that there are different parameters (Force, feeding Rate, MOQ, Tool Material, Tool Geometry, etc.), which are effecting the Drilling Tool Life.

IV. CONCLUSIONS

The purpose of this project is to make drilling machine flexible by making a flexible and portable structure which is light weight, easy to handle and works beyond the limits of conventional drilling machines. It will take less setup space. Also it provides all kind of drilling operations from one drilling machines in place of many types of drilling machines. We also make it usable for horizontal, vertical and inclined drilling operations. It can be useful for rimming, boring, etc. operations. It will help reducing the injuries occurred during working in hazardous environment.

V. FUTURE SCOPE

A. In future we can use hydraulic or pneumatic cylinders to raise arms up and down which provides proper linear movement of arms.

B. We can use servo motors and drivers to make it fully automatic which can be operated by computer, mobiles with wire connections or with Wi-Fi connections and also with remote controllers.

C. We can also make it fully automated by servo motor programming.

VI. ACKNOWLEDGMENT

This is the result of six months of hard working of our group at Grow More Faculty of Engineering, as the students of Mechanical Engineering. We all are feeling great to study in this kind of environment. The environment around here is free and innovative and we can do our work better than our capacity. And we are really thankful to our guide Prof. Rajnikant Rathod who always supported us in any condition and gave us time to solve all our queries. Also to our H.O.D. Prof. Ashish Patel who gave us better path to solve our problems and supports us. We are very much thankful to Prof. Maulik nagrachi & Prof. Chetan Patel & Prof. Dhaval Patel from the bottom of our heart for their kind help towards the project. Last but not the least to our friends, for their good and bad comments for our project because of them, we were able to think better and get the good ideas about our project, and our families for their immense support. We hope that you all read this report and give us your feedback. This report is dedicated to our group members and you all, who deserve it.

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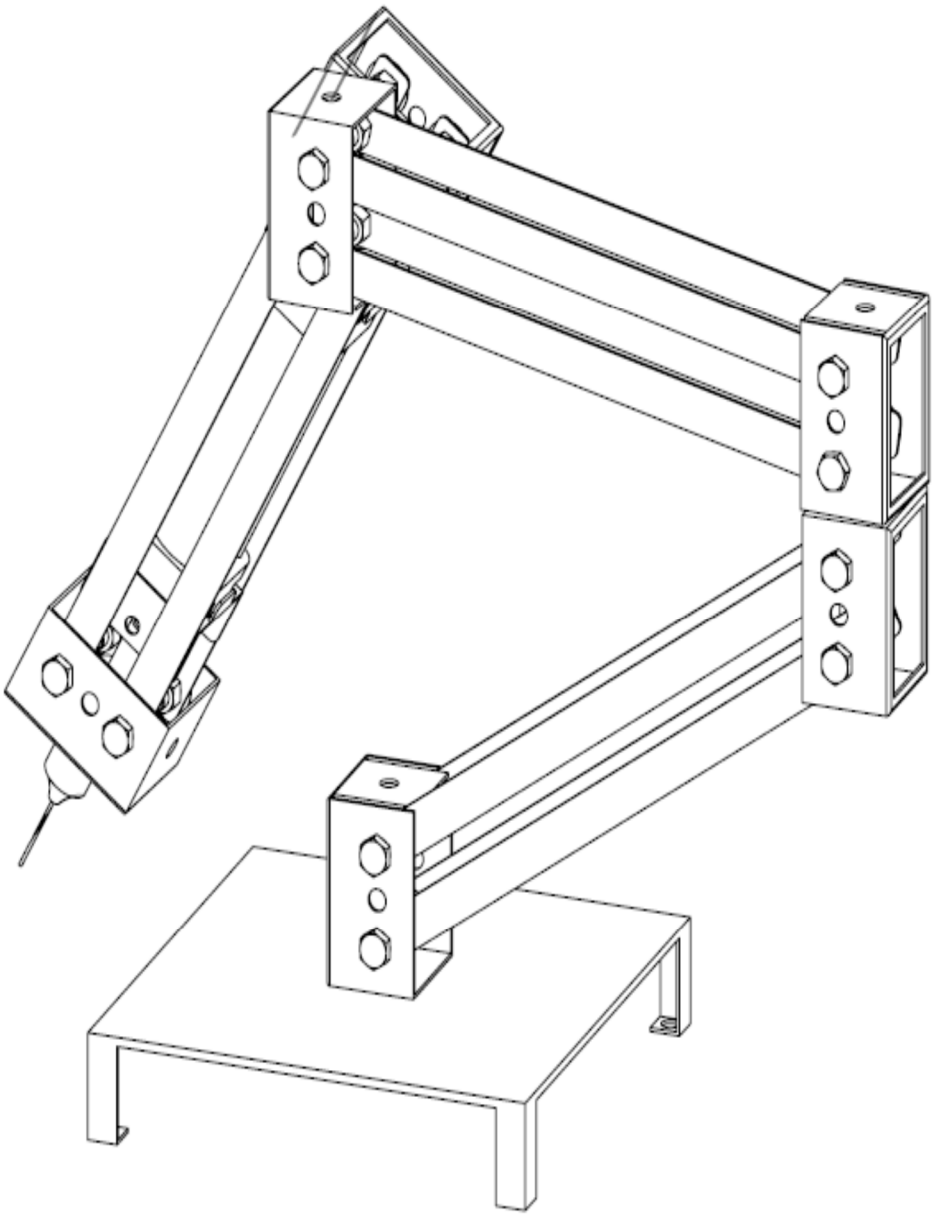
Structure Design



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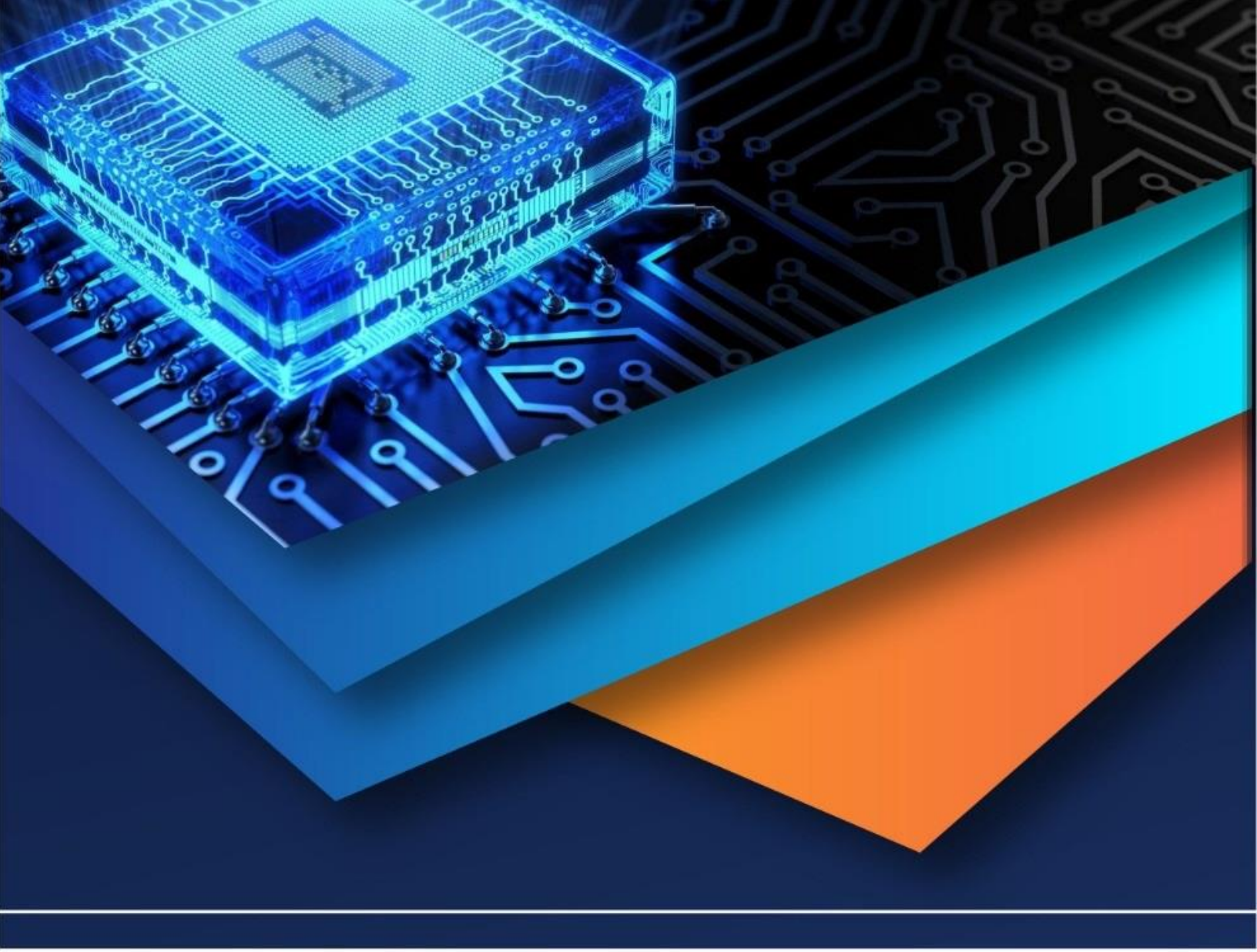

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