DESIGN AND FABRICATION OF AUTO FEED DRILLING MACHINE

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Abstract: In order to increase productivity and automate processes, the majority of industries today are working to improve their production processes and the necessary technology. These kinds of activities, which are most commonly employed in both small- and large-scale enterprises, include drilling, taping, boring, etc. The majority of industries still rely on manual tapping, drilling, and boring techniques. This traditional approach requires a lot of labor, takes a long time, is less accurate, and ultimately produces less output. Therefore, there is room to design a machine for a variety of operations that would solve every issue the traditional method faces. Therefore, we are going to create a portable auto feed device that requires less human intervention to operate than a hand drill because it runs on compressed air, which will help small manufacturing industries in terms of production. This paper provides details on the construction, design and fabrication methodology of an automated drilling machine.

Key Words: ***Design, Fabrication, Automation, Drilling Machine.***

I. INTRODUCTION

Automation is now essential for increasing productivity, cutting down on manufacturing time, and facilitating mass production at a reasonable cost. One of the crucial production operations that has to be automated is drilling and tapping. For exact hole location, excellent quality, and precise size, use the traditional drilling process, which is the most popular method of creating a hole in metal or other materials.[1]. The majority of industries still rely on manual tapping, drilling, and boring techniques. This traditional approach requires a lot of labor, takes a long time, is less accurate, and ultimately produces less output. Therefore, there is room to design a machine for a variety of tasks that would solve every issue the traditional process faces. A portable pneumatic device that uses compressed air to operate will require less human intervention than a manual taping, drilling, or boring [2]. Most industries still use manual methods for boring, drilling, and tapping. This conventional method is labor-intensive, labor-intensive, labor-intensive, and eventually yields lower output. As a result, it is possible to create a machine for a range of applications that would address every problem the conventional method encounters. Compared to a manual tap, drill, or bore, portable pneumatic equipment that runs on compressed air will require less human intervention [3]. The holes we obtain with SPM have the same accuracy and precise size. The air brake push rod drilling procedure, which is typically utilized in heavy vehicles, is being automated. [4]. The automated drilling machine's dependability and performance under various working conditions, extensive testing and validation procedures are carried out [5]. Installation and testing of appropriate hardware and software to provide automation and precision at a minimal cost. Additionally, it makes it possible for less experienced operators to use CNC machinery to build components [6]. The fixture setup in the current design is done by hand, which lengthens the cycle time for material loading and unloading. In order to minimize time when loading and unloading components, it is suggested that the current fixture be replaced with a hydraulic fixture with sensor-based depth control [7]. Our project's primary goal is to use pneumatic sources to enable the "Auto feed mechanism" in drilling machines to carry out a variety of machining operations. In order for a developing industry to remain profitable, the operations carried out and the parts (or) components produced should have the lowest possible manufacturing costs. Drilling, boring, and grinding machines, as well as screw tightening and loosening, are common tasks in small businesses and vehicle repair shops. Large and intricately designed parts cannot be machined with the aid of a standard machine, and each operation necessitates a separate machine, increasing the number of machines needed and the amount of space needed to house them, ultimately increasing the initial cost. The complex issues listed above are part of our project.

II. METHODOLOGY

A completely automated drilling machine must be constructed using a number of procedures. Specify the automated drilling machine's goals. Establish the requirements, including drilling capacity, amount of automation, and precise requirements. Create the drilling machine's general design, taking into account its parts, mechanisms, and structure. Source all necessary components such as motors, controllers, drill bits, etc.,

according to the design specifications. Check the components' quality and compatibility. As per the design, fabricate the drilling machine's frame and structure. Make sure the structure is precise, rigid, and stable enough to endure the drilling forces.

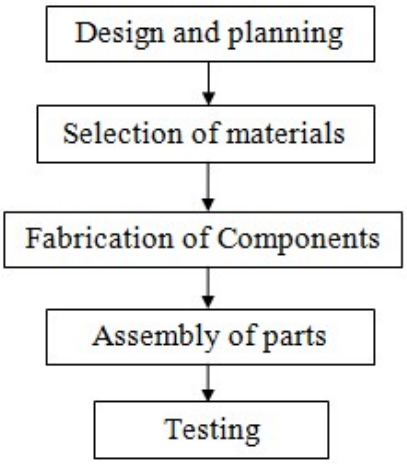

Fig 1. Process methodology

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III. DESCRIPTION OF EQUIPMENT

- DC MOTOR: - One kind of electric machine that transforms electrical energy into mechanical energy is a direct current (DC) motor. Direct current electricity is used by DC motors to generate mechanical rotation from this energy.
- DRILL BIT: - Cutting tools called drill bits are used in drills to remove material in order to form holes, which are nearly always circular in cross-section. Drill bits can make a variety of holes in a wide range of materials and are available in a variety of sizes and forms.
- BIT HOLDER: -Since the screw is held firmly in place and does not need to be held in place, magnetic bit holders greatly simplify the drilling operation. This is because there is less possibility of the fixing sliding off while fastening or unfastening it because the magnetic in the bit helps retain the screw to the drill.
- OUPLINGS: -In order to precisely transfer power from the driving side to the driven side while absorbing mounting error (misalignment), etc. of the two shafts, a coupling is a mechanical element part that joins them..
- JOINTS: -A joint is created when two or more surfaces are connected. But there are a variety of joint types, and a mechanical joint is one of them. While certain mechanical joints are made to last, others are not. Regardless, industrial machinery and equipment frequently contain them.
- MOUNTS: - A frame or other object to which an air handling unit (AHU) or other piece of equipment is fastened.
- RODS: - A rod is a long, round raw material bar.
- BASE FRAME: - Foundational Structures In addition to providing stiff platforms for the attachment of vibration isolators and supporting mechanical equipment, frames also prevent undue movement between the driven and driving members.
- SCREWS & BOLTS: - Since a bolt contains a plain part, it is not normally threaded all the way along its shank. However, a screw is entirely threaded into the head.

IV. DESCRIPTION OF PROJECT

- **Selection of Equipment:**

  - DC MOTOR
  - DRILL BIT
  - BIT HOLDER
  - COUPLINGS
  - JOINTS
  - MOUNTS
  - RODS
  - BASE FRAME
  - SCREW & BOLTS

- **Designed of auto feed drilling machine project module:**

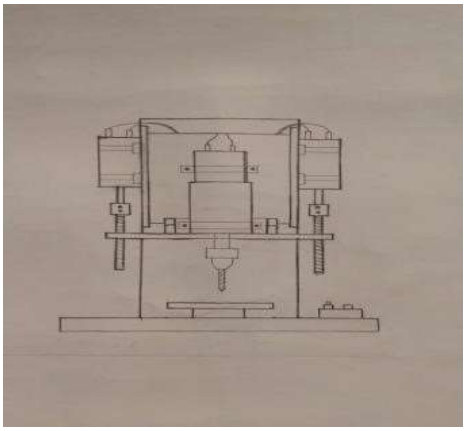

Fig 2. Design of Auto Feed Drilling machine

- **Assemble and Fabrication Procedure:**

Step 1: Part collection

We ultimately purchased a pneumatic cannon, pressure regulator, pipes, table wheels, and adaptor at a fair price after conducting a market survey.

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Fig 3. Pneumatic Gun and Pressure Regulator

Fig 4. Connecting Pipe

Step 2: Define Joints

We defined joints that are employed for both 360-degree gun rotation and the relative motion of arms. Three primary types of joints, including rotational top head, pin joints, and ball joints, were created by us shown in figure. 5. For future scope, we can convert to automation by utilizing servo motors in the designated joints.

Fig 5. Joints

Step 3: Design arms or linkages

We used a fabricator to assist us create mild steel arms or links (shown in figure. 6). Telescopic arms can be used to increase the pneumatic drilling machine's work envelope in thefuture.

Fig 6. Arms or Linkages

Step 4: Fabrication of table

We constructed a supporting table so that the pneumatic drilling equipment could be mounted on it and support its weight. To make the machine more portable, we give the table wheels (shown in figure. 7).

Fig 7. Supporting table

Step 5: Assembling of component

To give our machine the finishing touch, we proceed with the final assembly after gathering and designing all of the pieces (shown in figure. 8). In order to justify the title of our project, "DESIGN & DEVELOPMENT OF UNIVERSAL PNEUMATIC DRILLNG MACHINE," we finally put all the parts together into a single unit and created a universal drilling machine.

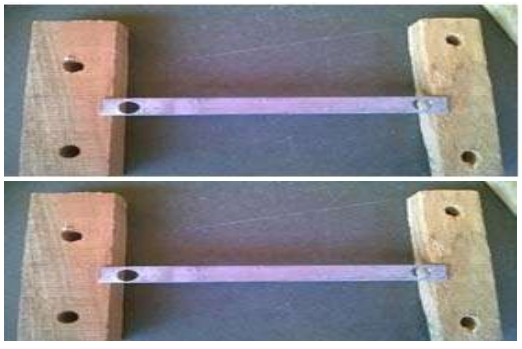

Fig 8. Assembling of component

Step 6: Fabrication of table

We conducted some experiments by using the proper tool and air pressure to drill various materials, including cast iron, aluminum, and wood. The work piece is being drilled

in the tests depicted in the picture. Our equipment is also capable of doing other operations including thread cutting, grinding, drilling, and tapping.

V. TEST RUN AND RESULT

- **Test Run:**

Figure 9 shows the drive system of this machine. When the motor is turned on, the pulley that is positioned above it begins to rotate along with the motor shaft. This transfers power and motion to the other pulley that is positioned above the Drill spindle via the belt. The spindle begins to rotate as a result, and the cutting instrument (drill) follows suit. The Feed Handle presses the drill against the work when it has to be fed into the job. While the motor keeps rotating at the same speed, multiple pairs of driving and driven pulleys can be used to adjust the spindle speed. On this machine, however, there is typically no setup for automatic feeding. Conversely, there is a reversing mechanism for the tapping. With the aid of a sleeve (locking arrangement), this device disconnects the pulley power transmission. In this, a gear arrangement helps transfer power from the motor shaft to the main shaft.

Fig 9. Auto Feed Drilling Machine

- **Result:**

It is clear that high work rates and low production costs were the goals of all industries dependent on production. This can be achieved by using multi-function operating machines, which require less time and power because they can operate at different centers. As a result, time consumption is significantly reduced. The objective of this collaborative initiative was to create affordable drilling equipment that would benefit the small-scale business. Drilling holes at any desired depth would be a helpful feature. Tiny businesses can benefit from the flexibility and efficiency of manufacturing processes as well as the reduction of capital costs that come with using tiny machine tools for small-scale part fabrication. A very small budget was used to develop and build the drilling equipment. In comparison to huge CNC machines, we may obtain a machine from this project that is both inexpensive and highly accurate. Our equipment can be equipped with a DC motor to enable automation through automatic feeding. By using a telescopic arm, we may expand the machine's operating envelope and make it easier to reach in any direction.

VI. CONCLUSION

Our project was a noteworthy undertaking in the domain of automotive repair shops and small-scale companies. The ability for workers to perform many tasks on a single machine is very helpful. Additionally, this effort has brought down the concern's costs. The project is set up to complete the given necessary task in its entirety.

VII. FUTURE SCOPE

The future scope of auto-feed drilling machines is highly promising due to advancements in automation and precision engineering. These devices are becoming more and more common in sectors where high-accuracy drilling is essential, such as manufacturing, automotive, and aerospace. Future auto-feed drilling machines will be able to use real-time monitoring, predictive maintenance, and adaptive control systems thanks to the integration of smart technologies like IOT and AI, which will increase productivity and dependability even further. Innovation in multi-axis auto-feed drilling machines is anticipated to be fueled by industries' increasing need for complicated and customized component designs. Additionally, energy-efficient designs and the usage of environmentally friendly materials will be promoted by sustainability efforts. High-volume production environments will require the use of CNC and robotic integration in auto-feed drilling systems. Lastly, these devices will be essential to completely automated and networked manufacturing ecosystems as Industry 4.0 concepts continue to gain ground.

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