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DEVELOPMENT OF MULTIDIRECTIONAL DRILLING MACHINE

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Abstract: Application of drilling is increasing day by day, drilling is widely used in industry and as same as in home also. There are many reactive forces while drilling a hole to particular point even if it is for home. Main abstract of this work is to develop an automatic drilling machine that can drill in vertical and horizontal directions.
Keywords: Drill, automatic, multi directions, motor, guide ways.

I. INTRODUCTION

The aim of the work is a simplifying point tasks and reducing labor work while drilling in small industries, practical institutes, in home. By use of screw drill can move in vertical and horizontal direction automatically. The usefulness of such type is to provide lost cost manufacturing process to the small scale industries for the development of the products. Hence such type of system can also be applied to certain learning institutions. Errors that might occur in manual drilling are totally eliminated with the 3-axis precise control of the drill head movements. So, drill bit positioning on a pad or breaking of tools is no more a problem.

II. SELECTION OF DIFFERENT COMPONENT

DC Motor :

DC motors are being used in industrial applications Coupled with a DC drive, DC motors provide very precise control. DC motors can be used with conveyors, elevators, extruders, marine applications, material handling, paper, plastics, rubber, steel, and textile applications. In this prototype project, we used three DC motors for different movement.

Fig 1 DC Motor

2. Threaded rod :

FIG 2 Threaded rod

In our project threaded rod is used for vertical and horizontal movement. The dimension of the threaded rod is for horizontal direction we use 50cm long and for vertical direction we use 30 cm long rod. The pitch diameter of the threaded rod is 3 cm.

3. Bearings :

FIG 3 Bearings

It can efficiently rotates the element where it will use. A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts.

4. Car screw jack :

FIG 4 CAR SCREW JACK

A jackscrew is a type of jack that is operated by turning a lead screw. In the form of a screw jack it is commonly used to lift moderately heavy weights, such as vehicles. More commonly it is used as an adjustable support for heavy loads, such as the foundations of houses, or large vehicles. These can support a heavy load, but not lift it.

5. Drilling tool :

FIG 5 Drill bit

Drilling is playing an important role in our project ,It is connected with the DC motor and it's use according to our requirement. As per surface hardness, surface finish ,and the material strength, there are various kind of drill material are used as given below.

6. Toggle switch :

FIG 6 TOGGLE SWITCH

A manually operated switch is on that is controlled by hand. A single pole single throw toggle switch connects or disconnects one terminal either to or from another. It is the simplest switches. Figure 6 below is an example of manually switches used in the project.

III. MATERIAL SELECTION

Many different materials are used for or on drill bits, depending on the required application. Many hard materials, such as carbides, are much more brittle than steel, and are far more subject to breaking, particularly if the drill is not held at a very constant angle to the work piece; e.g., when hand-held.

1) Steel

- Soft low-carbon steel bits are inexpensive, but do not hold an edge well and require frequent sharpening. They are used only for drilling wood; even working with hardwoods rather than softwoods can noticeably shorten their lifespan.
- Bits made from high-carbon steel are more durable than low-carbon steel bits due to the properties conferred by hardening and tempering the material. If they are overheated (e.g., by frictional heating while drilling) they lose their temper, resulting in a soft cutting edge. These bits can be used on wood or metal.
- High-speed steel (HSS) is a form of tool steel; HSS bits are hard and much more resistant to heat than high-carbon steel. They can be used to drill metal, hardwood, and most other materials at greater cu3tting speeds than carbon-steel bits, and have largely replaced carbon steels.
- Cobalt steel alloys are variations on high-speed steel that contain more cobalt. They hold their hardness at much higher temperatures and are used to drill stainless steel and other hard materials. The main disadvantage of cobalt steels is that they are more brittle than standard HSS.

Others

Tungsten carbide and other carbides are extremely hard and can drill virtually all materials, while holding an edge longer than other bits. The material is expensive and much more brittle than steels; consequently they are mainly used for drill-bit tips, small pieces of hard material fixed or brazed onto the tip of a bit made of less hard metal. However, it is becoming common in job shops to use solid carbide bits. In very small sizes it is difficult to fit carbide tips; in some industries, most notably PCB manufacturing, requiring many holes with diameters less than 1 mm, solid carbide bits are used.

IV. FABRICATION OF MACHINE AND PERFORMANCE CALCULATION:

Fabrication of multi direction By use of different component listed in above section and then performance calculation is done for the drilling action

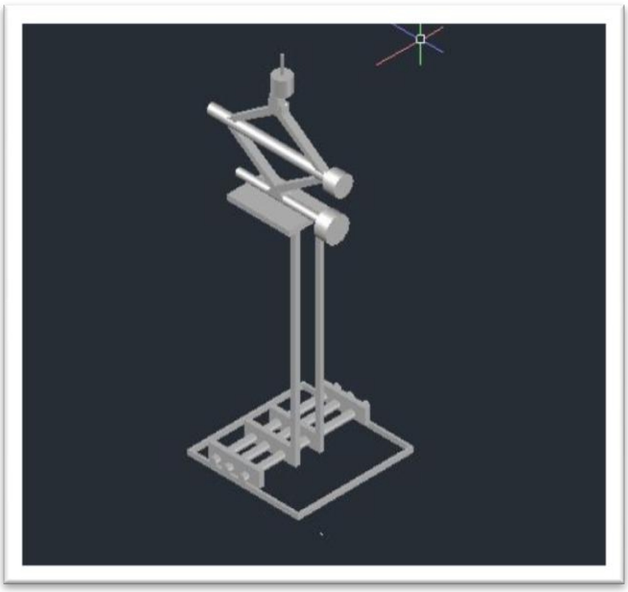

Fig 7. CAD model

Fig 8. Actual model

FORMULAS

RPM (rotation per minute)	$(V_c \times 12) \div (3.14 \times D)$, (rev/min)
Cutting speed	$V_c = (RPM \times 3.14 \times D) \div 12$, (ft/min)
Feed rate	$V_f = IPR \times RPM$, (inch/min)
Cross section area of hole	$AT = 3.14 \times R^2$, $(inch^2)$
Material removal rate	$Q = V_f \times AT$, $(inch^3/min)$
Power requirement	$P_c = (D \times f \times V_c \times K_c) \div (4 \times 33000 \times \eta)$, (HP)
Torque	$M_c = (H_p \times 5252) \div RPM$, (ft/lbs)
Feed force (approx.)	$F_f = 7 \times D/2 \times f \times K_c$, (lbs)
Machining time	$T_c = (L + H) \div V_f$, (min/piece)

Where,

f = feed per revolutions
h = distance from drill point to work piece before drilling
k_c = specific cutting force
L = depth of hole
η = machine efficiency
D = tool diameter
RPM = 500 rev/min
D = 0.196 inch
L = 1.3755 inch
H = 0.393 inch
V_f = 19.65

CALCULATION

$V_c = (RPM \times 3.14 \times D) \div (12)$
$= (500 \times 3.14 \times 0.196) \div (12)$
$= 25.643$ (ft/min)
$V_f = (0.0393 \times 500)$
$= 19.65$ (inch/min)
$AT = (3.14) \times R^2$
$= (3.14) \times (0.098)^2$
$= 0.030\ (inch)^2$

$Q = (19.65) \times (0.030)$
$= 0.5895\ (inch^3/min)$

$T_c = (L + H) \div V_f$
$= 0.09$ (min/piece)

V. COST CALCULATION

In this topic, we are trying to show the price of different component as per market survey.

Sr. no.	Material	Quantity	Cost(rupees)
1.	Motor	5	2500
2.	Steel frame	1	2000
3.	Tray	1	250
4.	Tools	-	1000
5.	Wooden arms	2	2000
6.	Drill bit attachment	-	200
7.	Racks	10	1000
8.	Pinions	5	250
9.	Battery	1	1000
10.	Other expenses	-	3000
	Total		13,700

VI. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced techniques with the help of growing technology, the project has been successfully implemented. Actually the aim behind the project is the cost of this machine. This machine provide drilling operation in various direction but this kind of machine is very costly so we will try to reduce the cost of this project in making through the material of the component and work on its design. It can be drill on three axis with high accuracy and less time consuming by using screw jack mechanism.

REFERANCES

[1] A. Albagul, K. Alsharef, M. Saad, Y. Abujeela, "Design and Fabrication of an Automated Multi-level Car Parking System", in Manufacturing Engineering, Automatic Control and Robotics, 2013.
[2] S. K., Robotics, McGraw-Hill, 2008.
[3] D. Shetty and R. Kolk, Mechatronics System Design.India, 2004.
[4] Hugh Jack, Automating Manufacturing system with PLC, version5.New York, 2007.
[5] Allan R. Hambley, Electrical Engineering Principles and Applications. Pearson Education Limited, 2013.
[6] Himanshu Mishra, PLC BASICS COURSE , Schneider Electric. India New Delhi.
[7] S. k. Bhattacharya, Industrial Electronics and Control,Delhi,2006.
[8] Khalid. A.alsudany, multi-level car parking system, College of Electronic Technology, BaniWalid, Libya, B.Sc. project, 2012.

