

Solar Powered Light duty Flexible Drilling Mechanism

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Abstract- A Drill machine that can be mounted and used in places with space constraints, powered by solar as a source of electricity instead of the conventional grid power. The mechanism provides easy movement of the drill and helps fix alignment problems during drilling at certain angle. Here horizontal, vertical and upside and downward drilling operations can also be performed. Solar as a source helps pursuit of clean energy. The accuracy of drilling operation can be improved.

Keywords- Drill machine, space constraints, solar, alignment problems, Clean energy.

the physical phenomenon result. Based on the principle of electric phenomenon results, solar cells or photovoltaic cells are made. They convert sunlight into direct current (DC) electricity. This is stored in a battery which powers the drill.

The mechanism has to be used manually to move the drill bit upto the drilling position. This mechanism helps reduce efforts and alignment problems in angular drilling.

The battery gets charged from the solar panels and this stored energy is used to power the drill. For large drills, bigger solar panels and batteries can be used.

I. INTRODUCTION

A drill may be a tool primarily used for creating spherical holes or driving fasteners. It is fitted with a small amount. It is fitted with a drill bit, depending on application, secured by a drill chuck. Drills are majorly used to drill holes in metal and wood. The capacity of drill is selected according to its application. Drill bits are selected based on the size of hole required.

The main use of our solar drill will be in small scale industries or for small household drilling purposes in wood or metal. The use of solar as a source of energy is taken in consideration because of the clean electricity drive undertaken by our government. Electricity from the grid may or may not be available when required. Where as Solar is much more reliable and cheaper in the long run. Also most of the rural areas are solar powered so electricity can be easily provided.

The world bank has also supported comes below preparation embody start upside technology, infrastructure for solar parks, bringing innovative solar and hybrid technologies to market, and transmission lines for solar-rich states.

II. WORKING PRINCIPLE

Photovoltaic result may be a technique of manufacturing DC electricity supported the principle of

III. LITERATURE REVIEW

G.Prasanth Kumar et.al. [1] studied the efficiency of operation competitive cost. Since a number of operation and hole can be performed in a simple unit. It is efficient and economical. Considering its uses and cost of project, it becomes relatively cheap when compared to other units. Prof. Gadhia Utsav D et.al.[2] Due to the various problems faced by conventional operation processes such as Poor thread finish, more time consumption, frequent tool breakage and many more. So, we have decided to design the machine which will make use of compressed air as a power source. Machine is to be presented for increasing their productivity as well as quality of job. It also gives the detailed description of machine mechanism and their different main parts of machine. In this we are defining different process parameters like spindle speed (rpm), cutting feed rate, cutting force, torque and power for their efficient working of operation. Aaditya Jain et.al.[3] studied how to use the solar power of the daily purpose and how to convert the solar power which is mostly DC to AC (all our application run on AC supply) using inverter and selection of solar panel of required power. Amit S. Wani et.al.[4] studied “chatter” phenomenon is produced due to the transverse vibrations of the drill, which adversely affect the assembly problem. Longitudinal vibration only changes the length of blunt hole and does not affect the though hole.

IV. CONCEPTUAL DESIGN AND METHOD

As we have adopted Approximation method for drafting out the dimensions of the mechanism were our aim was to build an Pilot model of flexible drill mechanism , were we designed the links and the hub using solidworks designing software as shown in figure .As we did trial and error for many dimension in solidworks before drafting out the proper dimensions which helped us to know were the links were tangling especially for the secondary links . And then we finally assembled all the designed components in solidworks software.

V. MATERIALS

The mechanism consists of linkages made of MS Steel. Other materials like cast iron could have been used but MS Steel is light in weight and better suited for this build. The target for this mechanism was to select a material for its construction which was strong enough to resist the vibrations during drilling and also light to make its movement easier , thus making the mechanism easy to use.

VI. COMPONENTS

1. PCB DRILLING MACHINE

Here we are using PCB drilling machine which is generally use to drill the circuit boards, We employed for pcb drilling machine because due to minimum vibration caused during the operation and hence gave better stability as we are developing pilotmodel. This drill machine is generally used in in drill spherical holes from 0.5- 2mm diameter . The drill bit used is of 0.5 and 2mm for testing purpose.



Fig 2 : PCB Drilling Machine

2. LINKS AND HUB

The links and hubs are made of MS steel which provides good strenght and stability to the mechanism , And also its corrosion resistant and will operate for long duration .It can absorb the vibration produce by th drill machine.We have used arc welding for welded joints in primary,secondary,tertiary hubs and links.

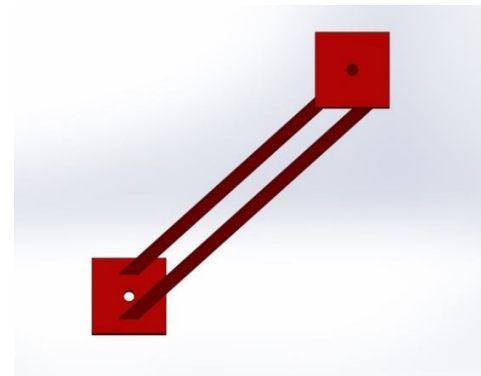


Fig 3: Primary link

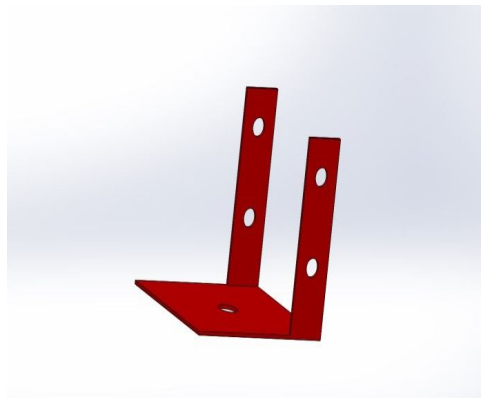


Fig 4: Secondary Hub

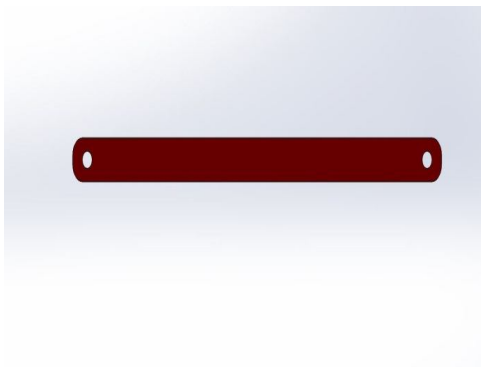


Fig 5: Secondary Link

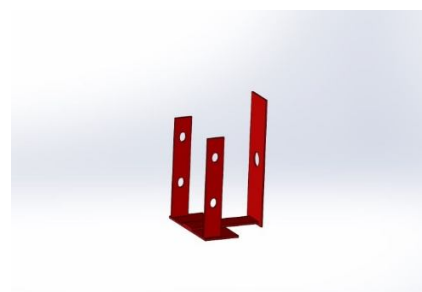


Fig 6: Tertairy link and Drill holder

3. SOLAR PANEL

These are used to convert solar energy into electrical energy. Two solar panels of 10W each have been used. For drills requiring higher input bigger solar panels of upto 50W can be used.



Fig 7. Solar Panel

4. BATTERY

The battery used here is lithium ion battery which help us to store the charge from the solar panel and can be used whenever required .The capacity of the battery is of 12 volts.



Fig 8: Battery

5. NUT, BOLT AND WASHER

Nuts,bolt and washer are used the fasten the linkks and to provide the rotational moment to the mechanism , bearing could have been used but it provided free rotation of the mechanism making it unstable hence nuta bolts with washer are used.



Fig 9: Nuts, Bolts and washer

VII. WORKING

The mechanism consists of primary links and secondary links. These linkages are connected by screws. For better rotation bearings can be used instead of screws. This mechanism is a pilot model designed to be used for light duty drilling purposes. The base can be rotated 360 degrees. The linkages help in providing free rotation of the secondary arm. The drill is placed on secondary arm and is allowed to rotate freely. The drill is connected to a battery for power requirements. This battery is charged using solar panels. Thus solar panels provide independence from intermittent grid electricity supply.

The battery gets charged from the solar panels and this stored energy is used to power the drill. For large drills, bigger solar panels and batteries can be used.

VIII. CONCLUSION

The mechanism works perfectly fine and assists in the drilling operation. The solar panels provides sufficient electricity for running of the drill machine for required time. For more capacity bigger battery and solar panels can be used. The alignment problems faced when drilling is performed without the aid of this mechanism is dealt with when using this mechanism. The holes obtained are of perfect shape and not out of shape. Thus it reduces the scrap waste of the material which would have been wasted otherwise. Thus this mechanism would in the long run prove economical.

The main advantage is independence from power grid supply and less dependence on conventional power source, free rotation of drill in any angular position, which increase the output and also high degree of precision of manual drill is obtained.

Applications

This pilot model can be used in rural areas for small drilling purposes.

Angular drilling operation can be performed.

FUTURE SCOPE

High capacity drills can be paired with bigger solar panels and bigger batteries for large scale production.

Motors can be connected at the joints and using arduino a robotic drilling arm can be made.

ACTUAL MECHANISM

Fig 10:Actual Mechanism

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