Multi Spindle Drilling Machine

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I. INTRODUCTION

The multi spindle drilling machine is one which can be used to drill a number of holes at various large and even unsymmetrical layouts according to our requirements, where the conventional Multi spindle drilling machines cannot be used. This is an improvement over geared drill heads and drill heads adopted with universal joints. This is an improvement over geared drill heads and drill heads adopted with universal joints. The drill head is mounted on the drilling machine table.The drill head spindle inserted into the machine spindle. It is used to drill number of holes in different layout according customer drawing. The report furnishes a cost estimation of all the components of the equipment by careful considerations of all factors such as cost of material, labor, machining and purchased components.

In case of mass production where variety of jobs is less and quantity to be produced is large, it is very essential to produce the job at a faster rate. This is not possible if we carry out the production by using general purpose machines. The best way to improve the productivity along with quality is by designing special purpose machine. The multiple spindle drilling attachment performs basic drilling operations; there are some specific functions that are performed more accurately. This attachment works mainly on planetary gear system arrangement.

Designing multi spindle drilling machine of is decided upon the principles of minimization of cost, improved productivity and better safety etc., which posses with high initial investment, higher maintenance cost etc. Special Purpose Machine is higher degree mechanism in which human participation is replaced by an application of mechanical, electrical, electronics, pneumatic system.

PROBLEM DEFINITION

In the conventional manner only one hole can be drilled at a time, but with increase in productivity demands a special purpose machine is needed which will increase productivity by performing multiple operations in one cycle. After the survey of complete manufacturing process it is noted that many of the components got rejected because of- Non uniform drilling.Poor finishing.

SOLUTION OF PROBLEM

The special purpose multi-spindle drilling machine is an ideal solution to the above problem which is used to perform fifteen drilling operations at a time. In the multi-spindle drilling machine fifteen spindles are driven simultaneously which carry fifteen chucks. The chucks can receive twist drills to perform the desired operation.

USE MULTI SPINDLE DRILLING MACHINE

Which can be widely used to drill products like printed Circuit Boards, Engine heads and other Automobile components. Extreme care should be there to drill multi holes at different layouts. The MULTI SPINDLE DRILLING MACHINE helps to achieve accurate and identical drilled layouts in mass production.

OBJECTIVES

Referring to the above scope following objectives of the work were outlined.

1. To study customer requirement at output and analyze
2. We can drill 3 holes at a time.
3. To increase the productivity of machine.
4. To make a machine simple to operate.

II. LITERATURE REVIEW

S. R. Gawande , S. P. Trikal (2016)presented the special purpose multi-spindle drilling machine is an ideal solution to the non-uniform drilling and poor finishing this problem which is used to perform fifteen drilling operations at a time. In the multi-spindle drilling machine fifteen spindles are driven simultaneously which carry fifteen chucks. The chucks can receive twist drills to perform the desired operation.

Prof. K. G. Sontakke (2014) Studied Design and analysis of drilling cum riveting machine they develop drilling machine cum with riveting machine to reduce operation time and

transportation time for riveting purpose. This machine has orbital riveting machine for riveting purpose. This study concludes that using drilling cum riveting machine increases productivity.

Prof. Ms. A. A. Shingavi [2015] Studied on Design of multiple spindle drilling machine. In this case study they developed multi-spindle drilling head which has six spindle assembly for drilling six holes at a time this assembly has planetary gear train for transmitting motion of from main arbor to sub spindles. This multi-spindle drilling head reduces time of drilling as six holes at a time are drilled this increases production rate and it has low weight and low cost.

Mr. K. K. Powar [2015] Studied on Optimization of process parameter for multi-spindle drilling machine by using taguchi method. In this case study they investigate effects of process parameter on various drill diameter by input parameters speed, feed rate etc. and investigation is done by use of taguchi method

Pravin A. Desai and Vishal V. Jadhav (2017)presented a machine, it can be improved in future by using different housing structures which can be accommodated on the machine bed making set up changes as per requirements of components with certain adjustments. Presently the SPM can drill the rear brake drum of heavy commercial vehicle and with different models for TELCO. This machine can also be used for their other model vehicles. Other models which differ by the center distance between flanges can be accommodated provided the PCD remains same. In future to cover all components the part family flexibility can be achieved by replacing the drilling heads for components with different PCD. So, by this arrangement SPM can be used for variety of components of same kind.

U. Deepak , C. Tharun Prabhakar , P .M. Prasanth , S. Manikandan (**2017**) presented the multi-spindle drilling attachment is an ideal solution to the above problem where in the conventional drilling machine is used to perform three operations at a time, so also different operations like drilling, reaming, countersinking or spot facing can be donesimultaneously. In the multi-spindle drilling attachment three spindle are driven simultaneously which carry three dill chucks. The drill chucks can receive twist drills, reamers, countersink drills or spot facing cutters to perform the desired operation

Prof. Chukwumuanya- investigated Design and developed multiple spindle drilling head for mass production of Peugeot 504 automobiles brake drum. For this design they developed multi-spindle drilling head for drilling six holes at a time, in which four holes of Ø14.5mm and two holes of Ø8.5mm. They analysis the various gear forces theoretically. It concludes that mash increases production rate as compare to individual drilling operation.

Prof. M.B. Bankar- Studied Improvement in design and manufacturing of multiple spindle drilling attachment, in which they used planetary gear system for drilling operations. In this case study we briefly give information about design of drilling attachment for motor selection to its gear box. This study concludes that Multi spindle drilling attachment increase productivity reduces cycle of operation and performs drilling operation more accurately.

III. CONCLUSION FROM LITERATURE REVIEW

From the literature survey it can be seen that, drilling machine has been topic of interest for many researches. The research started from developing theories relates to A Review on Multi Spindle Drilling Special Purpose Machine with Respect to Productivity.

Prof. K. G. Sontakke Has studied, Design and analysis of drilling cum riveting machine they develop drilling machine cum with riveting machine to reduce operation time and transportation time for riveting purpose

Prof. Ms. A. A. Shingavi. has they developed multi-spindle drilling head which has six spindle assembly for drilling six holes at a time this assembly has planetary gear train for transmitting motion of from main arbor to sub spindles.

Mr. K. K. Powar, has studied on Optimization of process parameter for multi-spindle drilling machine by using taguchi method

S. R. Gawande, S. P. Trikal has presented the special purpose multi-spindle drilling machine is an ideal solution to the non-uniform drilling and poor finishing this problem which is used to perform fifteen drilling operations at a time.

Pravin A. Desai and Vishal V. Jadhav, has improved machine in future by using different housing structures which can be accommodated on the machine bed making set up changes as per requirements of components with certain adjustments.

IV. PROBLEM DEFINITION

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special purpose machine is needed which will increase productivity by performing multiple operations in one cycle. After the survey of complete manufacturing process, it is noted that many of the components got rejected because of-
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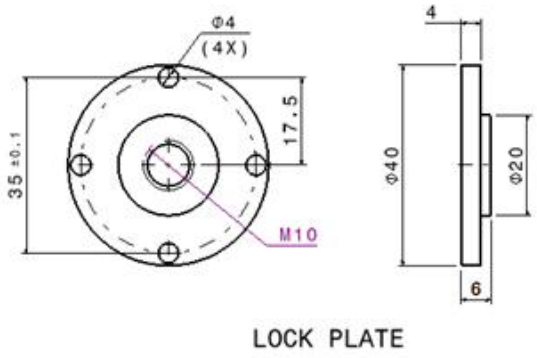
CUSTOMER DRAWING

Customer require to design multi spindle drilling machine for 3 holes with fix P.C.D.

LOCAKING PLATE BEFORE DRILL

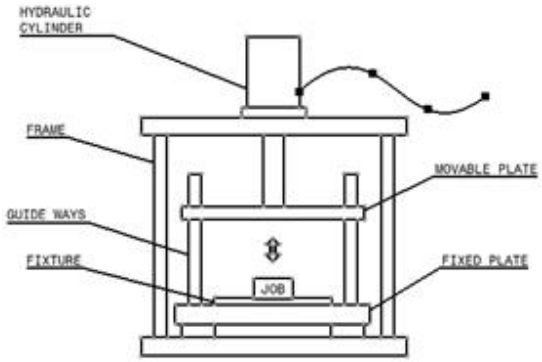
LOCAKING PLATE AFTER DRILL

2D DRAWING



LOCK PLATE

Conceptual Drawing of Machine



V. PROPOSED WORK

It is proposed to carry out" Design and manufacturing of Multi spindle drilling machine", to design special purpose machine which reduce cycle time of operation and main objective it to increase productivity in large extent as compared to conventional drilling machine.

Phase I :

1.Idea Generation -

This is a preparatory phase which involves the review of the literature and theoretical study of Design and Development of multi spindle drilling machine.The purpose of this project is for mass production and cost reduction.

2.Product Specification -

The basic aim behind the development multi spindle drilling machine of is for reduce mass production and cost reduction . This phase includes selection of material ,

collecting information about required components and actual working of system

3. Feasibility study –

Here we analysis and evaluation of a proposed project to determine if it

(1) is technically feasible,
(2) is feasible within the estimated cost, and
(3) will be profitable

Phase II:

1. Design (3D Model)-

It will start with the design criteria for individual system component. This includes design of shaft, Gears, and other system components. Also, it includes selection of proper elements for easy and fast response.We are designing 3D model with the help of 2D and 3D software like AUTO-CAD,Solid-Works ,CATIA

2. Failure Analysis-

Failure analysis is the process of collecting and analyzing data to determine the cause of a failure, often with the goal of determining corrective actions or liability.here we are analysis the gear and shaft by analysis software like ANYSIS

Phase III:

1.Process Design and manufacturing component -

Process design is concerned with the overall sequence of operations required to achieve the product specifications. It specifies the type of work stations that are to be used, By using specification which are obtained from the previous phase actual manufacturing of individual component will be done

Phase IV:

7.Assembly -

After manufacturing of the component assembly of that part is done so that whole experiment setup will be done so that the whole experimental setup will be used for its technical evaluation.

8. Testing-

The experimental test were conducted to check the actual performance of setup the working of all components like gears, shafts and other components to make a statement about good working condition of setup.

9.Launch-

After successful testing of all the component during working and by evaluating there all parameter we are launching that product to the market

VI. PLANNING WIORK

MONTH	Phase I	Phase II	Phase III	Phase IV
August				
September				
October				
November				
December				
January				
February				

APPROXIMATE COST OF PROJECT: Rs. 50000/-

- Drill machine(single spindle) – 8000/-
- Cut sleeve(3qty)-2000/-
- Gear(4 qty)-4000
- Hydraulic cylinder-15000
- Manufacturing part-10000
- Assembly,testing & Design -10000

VII. CONCLUSION

- With the help of this machine, we can drill three holes at a time
- The efficiency of this machine is better than the older machine.
- Large saving in power have been achieved.
- The machine is very simple to operate.
- Finally, we concluded that the designed machine is an important step towards fulfilling the need for the company.

REFERENCES

[1] S. R. Gawande , S. P. Trikal, “Development of Multi Spindle Drilling Machine to Enhance the Productivity in Amba Stainless Steel Kitchen Trolley Manufacturer” International Journal of Science and Research (IJSR) ,ISSN (Online): 2319-7064

[2] Prof. K.G.Sontakke, Prof. R. D. Vaidya and Prof. D.M. Mate, "Design and analysis of drilling cum riveting Machine", Journal of emerging technologies and innovative research (JETIR), Volume 1, Issue 6, ISSN-2349-5162, Nov 2014

[3] Prof. Ms.A.A.Shingavi, Dr.A.D. Dongare and Prof.S.N.Nimbalkar, "Design of multiple spindle drilling machine", International journal of research in advance technology (E-ISSN: 2321-9637) Special Issue 1stInternational conference on advent trends in engineering, science and technology (ICATEST 2015),08 March 2015

[4] Mr.K.K.Powar, Prof. (Dr) V.R.Naik and Prof.G.S.Joshi, "Optimization of process parameter for multi spindle drilling machine by using taguchi method", International journal of advanced technology in engineering and science, Volume No.03, Issue No.03, March 2015.

[5] Prof. P.R. Sawant, Mr. R. A. Barawade, "Design and development of spm-a case study in multi drilling and tapping machine" International Journal of Advanced Engineering Research and Studies E-ISSN2249–8974Vol. I/ Issue II/January-March, 2012/55-57.

[6] Mr. K. K. Powar, Prof. (Dr) V. R. Naik, Prof. G. S. Joshi, "Design & development of multi orientation drilling special purpose machine subsystem", International Journal of Engineering Research and Development e-ISSN: 2278-067X, p-ISSN: 2278-800X, Volume 11, Issue 04 (April 2015), PP.32-38

[7] S. R. Gawande , S. P. Trikal, "Design of Special Purpose Multi Spindle Drilling Machine" International Journal of Innovative and Emerging Research in Engineering e-ISSN: 2394 – 3343 p-ISSN: 2394 – 5494

[8] Pravin A. Desai and Vishal V. Jadhav, Design of Multi Spindle Drilling Machine. International Journal of Design and Manufacturing Technology 8(2), 2017, pp. 01–22. http://www.iaeme.com/IJDMT/issues.asp?JType=IJDMT &VType=8&IType=2

[9] U. Deepak , C. Tharun Prabhakar , P .M. Prasanth , S. Manikandan, "Design of Multi Spindle Drilling Machine" International Conference on Latest Innovations in Applied Science, Engineering and Technology (ICLIASET 2017), March 2017

[10] Yaman Patle, Nikalas Bhandakkar, Prashant Wangarwar, Pranay Thakre, Sagar Awachat, Ms. Manisha Fande, " Design and Fabrication Multi Spindle Drilling Machine with Different Pitch Hole" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 - 0056