Design and Fabrication of Abrasive Belt Grinding

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Abstract: Abrasive belt grinding machine has been mainly developed for grinding the specimen to get a good surface finish. In this machine we have using the motor source of ac current operated device. This equipment is good efficient compared to other, so good finishing is obtained by using this machine so we can obtain the quality on specimens in industries. Here we have fabricated the abrasive grinding machine; it's a new innovative concept. This machine has been mainly developed for grinding the specimen to get a good surface finish. In this machine we have using the motor source of ac current operated device. This equipment is good efficient compared to other, so good finishing is obtained by using this machine so we can obtain the quality on specimens in industries.

Index Terms – Abrasive Belt Grinding, Motor Operated, Vice Clamping.

I. INTRODUCTION

With the increasing requirements of modern industrial technology and high-performance technological products in respect of part precision, surface integrity, machining efficiency and batch quality stability, grinding has played a more and more important role. It becomes an important part of advanced machining technology and equipment, and is a research frontier in manufacturing science. Grinding is the process of removing metal by the application of abrasives which are bonded to form a rotating wheel or belt. When the moving abrasive particles contact the workpiece, they act as tiny cutting tools, each particle cutting a tiny chip from the workpiece. It is a common error to believe that grinding abrasive wheels remove material by a rubbing action; actually, the process is as much a cutting action as drilling, milling, and lathe turning. Grinding is used to finish work pieces that must show high surface quality (e.g., low surface roughness) and high accuracy of shape and dimension. As the accuracy in dimensions in grinding is on the order of 0.005mm, in most applications it tends to be a finishing operation and removes comparatively little metal, about 0.25 to 0.50 mm depth. However, there are some roughing applications in which grinding removes high volumes of metal quite rapidly. Thus, grinding is a diverse field. Therefore we have designed grinding machine in miniature and portable form which can give very precise machining and grind up to 0.01-0.005 mm depth with high accuracy.

II. COMPONENTS/ MATERIALS REQUIRED

2.1. AC MOTOR

An induction motor (IM) is a type of alternating current motor where power is supplied to the rotating device by means of electromagnetic induction. It is also called asynchronous motor. An electric motor converts electrical power to mechanical power in its rotor (rotating part). There are several ways to supply power to the rotor. In a DC motor this power is supplied to the armature directly from a DC source, while in an induction motor this power is induced in the rotating device. An induction motor is sometimes called a rotating transformer because the stator (stationary part) is essentially the primary side of the transformer and the rotor (rotating part) is the secondary side. Induction motors are widely used, especially poly phase induction motors, which are frequently used in industrial drives. Induction motors are now the preferred choice for industrial motors due to their rugged construction, absence of brushes.

2.2. BEARING

A bearing is a device to permit constrained relative motion between two parts, typically rotation or linear movement. Bearings may be classified broadly according to the motions they allow and according to their principle of operation as well as by the directions of applied loads they can handle. Low friction bearings are often important for efficiency, to reduce wear and to facilitate high speeds. Essentially, a bearing can reduce friction by virtue of its shape, by its material, or by introducing and containing a fluid between surfaces.

2.3. MACHINE VICE

It is a device consisting of two parallel jaws for holding a work piece; one of the jaws is fixed and the other movable by a screw, a lever, or a cam. When used for holding a work piece during hand operations, such as filing, hammering, or sawing, the vise may be permanently bolted to a bench. In vises designed to hold metallic work pieces, the active faces of the jaws are hardened steel plates, often removable, with serrations that grip the work piece; to prevent damage to soft parts, the permanent jaws can be covered with temporary jaws made from sheet copper or leather. Pipe vises have double V-shaped jaws that grip in four places instead of only two. Woodworking vises have smooth jaws, often of wood, and rely on friction alone rather than on serrations.
For holding work pieces on the tables of machine tools, vises with smooth hardened-steel jaws and flat bases are used. These machine vises are portable but may be clamped to the machine table when in use; means may also be provided for swiveling the active part of the vise so that the work piece can be held in a variety of positions relative to the base. For holding parts that cannot be clamped with flat jaws, special jaws can be provided.

2.4. BELT GRINDING

Belt grinding is an abrasive machining process used on metals and other materials. It is typically used as a finishing process in industry. A belt, coated in abrasive material, is run over the surface to be processed in order to remove material or produce the desired finish The belt grinding process is variable by adjusting certain parameters such as belt speed, grinding pressure, feed speed, durometer of the contact drum, size of the contact drum and the abrasive belt that is used. The machines can be made for wet or dry operation. Furthermore, a wide belt grinding machine can be constructed with single or multiple heads. The first head is used for coarse grinding and the next heads gradually make a finer finish. Wide belt grinding is also used as a high stock removal method for special metals (e.g. stainless steel, titanium, and nickel alloys). Belt grinding belongs to elastic grinding and has the multi-functions of grinding, milling and polishing, etc. It is characterized by good work piece-shape adaptability, low vibration of grinding system, low roughness of machining surface, maintenance of residual compressive stresses, low grinding temperature and resistance to work piece burning; it also has the feature of cool grinding. The V-shaped section can be finished only by the belt grinding method.

III. GRINDING METHODS

Wide belt grinding is a familiar process in industry as well as home applications. There are several basic methods for belt grinding: Stroke belt, Platen belt, Wide belt In general there are three basic elements of the belt-grinding machine: work rest support, grinding head and a regulating head. These components differ for all the methods but in general the work piece is pressed between the grinding head and the rest support. The objective of the regulating head is to coordinate the belt pressure. Wide belt grinding One of the most common methods is wide belt grinding. The belt grinding process is variable by adjusting certain parameters such as belt speed, grinding pressure, feed speed, duro meter of the contact drum, size of the contact drum and the abrasive belt that is used. The machines can be made for wet or dry operation. Furthermore, a wide belt grinding machine can be constructed with single or multiple heads. The first head is used for coarse grinding and the next heads gradually make a finer finish. Wide belt grinding is also used as a high stock removal method for special metals (e.g. stainless steel, titanium, and nickel alloys)

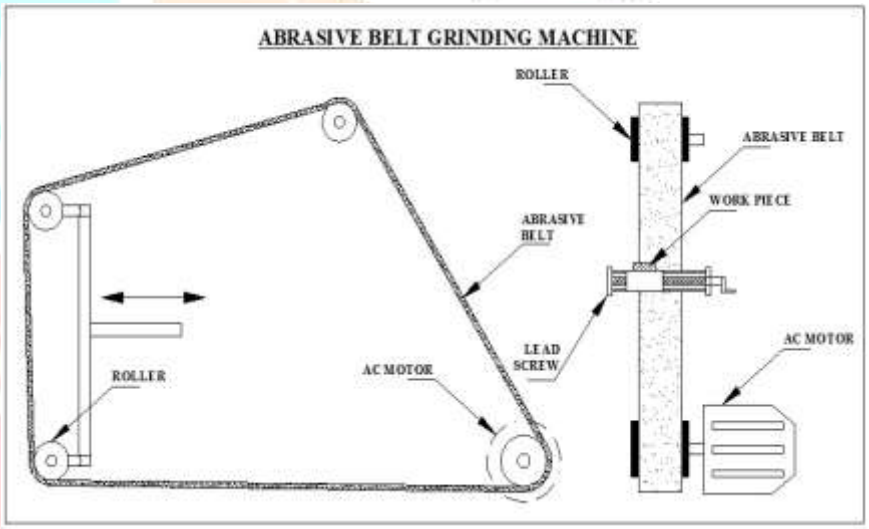

Fig.1. 2D Model of Abrasive Belt Grinder

IV. WORKING PRINCIPLE

In this construction ac motor is used to drive the abrasive belt wheel. This rotational motion is given to the roller. At the end of roller one more roller is meshed for the conveyor to run. The abrasive belt is fixed to the conveyor for grinding operation. Now the placing of the tool will results in grinding. The other end of the conveyor is fitted to a roller which rotates the conveyor. Thus, this Belt type grinding machine is generally used for polishing the small metallic components and worn the surface of woody components. In this machine abrasive belt fitted on the rollers. The coupling is used for transmission of power from electric motor to the roller shaft. As the first shaft from the motor is rotated then all the rollers rotated with same speed because of abrasive belt wound over the surface.

When we keep the any small part on abrasive belt and apply the pressure over the surface of the belt, then the small component polished. Because of this machine, good quality of glassing also obtained for good looking component. The abrasive belt is available in various sizes in the market. Belt grinding machine may be dry belt wet belt or combination belt. Belt grinding machine is used for heavy stock removal or for light polishing work depending upon the type of belt grade used. This Oblique grinding machine is used for the grinding of any oblique surfaces. The grinding can be done for the stationary object. The angle grinding is done based on the position of the two adjustable rollers in the machine. The flexibility of the belts are adjusted using the screw. Thus, the finishing will be smooth and any angled parts are finished.

V. CONCLUSION

The project carried out by us made an impressing task in the field of small scale industries and automobile maintenance shops. It is very useful for the workers work in the lath and small scale industries. This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available. This machine has been mainly developed for grinding the specimen to get a good surface finish. In this machine we have using the motor source of ac current operated device. This equipment is good efficient compared to other, so good finishing is obtained by using this machine so we can obtain the quality on specimens in industries.

REFERENCES

[1] B. Varghese, S. Pa. Hare, R. Gao, C. Guo and S. Malkin, "Development of a sensor-integrated 'Intelligent' grinding wheel for in-process monitoring," Annals of the CIRP Vol. 49, No. 1, pp. 265-270, 2000.

[2] C. Koepfer, "What is single point OD grinding," Modern Machine Shop, Vol. 7, No. 70, pp. 62-99, 1997.

[3] L. Zhou, J. Shimizu, A. Muroya, et al., "Material removal mechanism beyond plastic wave propagation rate," Precision Engineering, Vol. 27, pp. 109-116, 2003.

[4] H. K. Tönshoff, T. Friemuth and J. C. Becker, "Process monitoring in grinding," Annals of the CIRP, Vol. 51, No. 2, pp. 551-569, 2002.

[5] T. Jin and G. Q. Cai, "Analytical thermal models of oblique moving heat source plane for deep grinding and cutting," Journal of Manufacturing Science and Engineering, American Society of Mechanical Engineers, Vol. 123, No. 1, pp. 185-190, 2001.

[6] H. H. Zhao, B. F. Feng and G. Q. Cai, "Study of ultra- high speed grinding mechanism with molecular dynamics simulation," Key Engineering Materials, Vol. 259-260, pp. 302-306, 2004.

[7] S. C. Xiu, G. Q. Cai and C. H. Li, "Investigation on Natures of Quick-point Grinding for Green Manufacturing", Proceedings of the 11th International Conference on Industrial Engineering and Engineering Management, Beijing: China Machine Press, (2005), pp. 481-483.

[8] C. H. Li, Z. R. Liu, G. Y. Liu and Y. C. Ding, "Experimental Investigations of Mechanical Characteristics and Tribological Mechanisms of Nanometric Zirconia Dental Ceramics", The Open Materials Science Journal, vol. 5, (2011), pp. 178-183.

[9] C. H. Li, Z. L. Han, C. Du and Y. C. Ding, "Numerical study on critical speed modeling of ultra-high speed grinder spindle", Communications in Computer and Information Science, vol. 201, no. 1, (2011), pp. 202– 209.

[10] L. D. Zhu and W. S. Wang, "Modeling and Experiment of Dynamic Performance of the Linear Rolling Guide in Turn-milling Centre", Advanced Science Letter, vol. 4, no. 6, (2011), pp. 1913–1917.

[11] Y. L. Hou, C. H. Li, Z. L. Han, J. Y. Li and Y. C. Ding, "Examination of the Material Removal Mechanisms During the Abrasive Jet Finishing of 45 Steel", Advanced Science Letter, vol. 4, no. 4-5, (2011), pp. 1478- 1484.

[12] Y. L. Hou, C. H. Li and Q. Zhang, "Investigation of structural parameters of high speed grinder spindle system on dynamic performance", Int. J. Materials and Product Technology, vol. 44, no. 1/2, (2012), pp. 92- 114.

[13] C. H. Li, Z. R. Liu, Y. Zhou and Y. C. Ding, "Investigation on Critical Speed and Vibration Mode of High Speed Grinder", Noise and Vibration Worldwide, vol. 42, no. 10, (2011), pp. 47-54.