

Review Paper on Automatic Bottle Capping Machine by using Cam Profile

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Abstract— Nowadays automation is important factor in all industries. Every process is carried out by the automation. Automation becoming increasingly important in manufacturing process because computerized machine are capable of handling repetitive task quickly and effectively. So, the automation reduces the ideal time of the process. In automatic capping machine different mechanism are used such as Screw mechanism, Geneva mechanism and Timing belt and pulley etc. In many industries we saw that the screw mechanism is mainly used. Here we tried to perform the automation capping machine by cam profile, the process becomes very simple. The Geneva mechanism is also used in our experiment which will use for proper timing of capping a bottle. The objective of our project is to design and develop the automatic machine for capping the bottle in less time and to implement hardware installation and Mechanical mountings.

Key words: Geneva Mechanism, Cam Follower, Screw Mechanism, Timing Belt and Pulley

I. INTRODUCTION

A. Automation

Automation is the innovation by which a procedure or methodology is performed without human help. Automation or programmed control is the utilization of different control frame works for working hardware, for example, apparatus, forms in plants, boilers, exchanging on phone systems, guiding and adjustment of boats, air ship and different applications and vehicles with negligible or diminished human mediation. A few procedures have been totally computerized.

Automation has been accomplished by different means including mechanical, pressure driven, pneumatic, electrical, electronic gadgets and PCs, for the most part in blend. Entangled frameworks, for example, current processing plants, planes and ships normally utilize all these joined procedures. The advantage of automation incorporate work reserve funds, investment funds in power costs, funds in material expenses, and enhancements to quality, exactness and accuracy. Use of simple devices utilizing relatively cheap and readily available components, to minimize or eliminate human effort in certain operations is called Low Cost Automation.

Automation plays an increasingly important role in the world economy. One of the important applications of automation is in the soft drink and other beverage industries, where a particular liquid has to be filled continuously. Automation is the use of control system and information technologies to reduce the need of human work in the production of goods and services. The concept of Automation is so versatile that it can bring radical development in almost every field. In some of the industrial situations and their

internal environment, the microcontrollers are not well suited since they are less immune to electrical noise, vibrations and temperature.

B. Bottle Capping Machine

A central protest of the present innovation is to give a container topping machine that applies screw strung jug tops upon bottles in a fast creation way and which in real utilize has turned out to be favorable over customarily utilized jug top applying apparatus. Another question is to give a container topping machine that incorporates a jug top chute that buoys keeping in mind the end goal to vibrate and keep the tops from interlocking or sticking while at the same time moving along the chute.

Another protest is to give a jug topping machine in which the top is turned at various paces amid topping task with the goal that the whole topping activity is quick along a rapid generation line. Amazingly, one more question is to give a jug topping machine which is promptly customizable for taking care of jugs that are of different shape as round and hollow, upwardly decreased or downwardly decreased.



Fig. 1: Capping Machine

Amazingly, one more question is to give a jug topping machine in which the top chute is completely movable so to suit tops of different diverse distances across and in addition statures, such tops being either plastic, metal or plastic carefully designed, for example, are required by FDA youngster assurance purposes. Different items are to give a jug topping machine which is straightforward in plan, cheap to produce, tough in development, simple to utilize and effective in task.

C. Geneva Mechanism

The name got from the gadget's most punctual application in mechanical watches. The Geneva drive is normally known as a Maltese cross instrument. The Geneva drive is a component

which changes over ceaseless pivot into an irregular turning movement. There is a stick in the pivoting drive wheel which moves into an opening of driven wheel venturing ahead by a unit. Standard course of action of Geneva wheel has four openings or six spaces and advancing a stage of 90 degrees for every pivot of drive wheel. Its different applications are film projectors, instrument changers in CNC machine, bank note checking machine, paper cutting machine, bottle filling machine and so on.

The Geneva instrument comprises of a driving wheel which related with 4 outspread spaces. The hub on the driving plate and wheel give a locking impact against revolution of the opened wheel e.g. in the position the wheel can't turn. The wheel currently starts to pivot when it has turned through an edge 90 degree the stick leaves radials opening and quickly these interacts with the circular segment of wheel keeping its further revolution. Along these lines this component is utilized in points of confinement and edge straightforward programmed machine for ordering cutting devices and in numerous shaft programmed machines for ordering axle through a steady Angle.

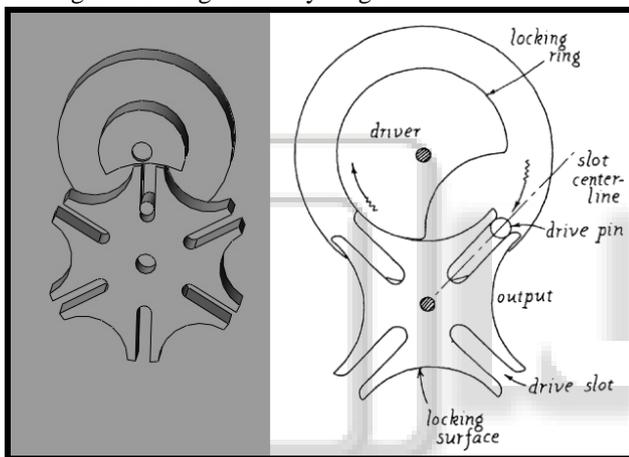


Fig. 2: Geneva Mechanism

Geneva mechanisms have long been popular as a means of producing positive incremental motion. This popularity stems in part from the simplicity of the mechanism, both in design and construction, which makes it a relatively low-cost indexing device. In addition, the mechanism inherently produces a precise positioning motion that is necessary for many applications. In the applications where this mechanism is presently utilized, it has proven to be extremely trouble free and dependable. In the future it is expected that this device may find many applications requiring higher speeds. As the higher speeds become necessary, the mechanism becomes less attractive as an incremental device because of its kinematic limitations. For instance, a severe limitation under these conditions may result from the high maximum wheel acceleration relative to its average acceleration. This characteristic may cause excessive dynamic loads which in turn can cause severe drive pin and slot wears and/or wheel breakage. Therefore the analytical design problem in the case of high-speed Geneva mechanisms, where inertial loads are dominant, is one where the best combination of the design variables is sought to reduce the inherent kinematic limitations of the mechanism.

D. Cam & Follower

Cams are utilized for basically indistinguishable reason from linkages, that is, age of unpredictable movement. Cams have favorable position over linkages since cams can be intended for significantly more tightly movement determinations. Cam configuration is likewise, in any event on a basic level, less difficult than linkage outline, despite the fact that, practically speaking, it tends to be extremely relentless. Mechanization of cam configuration utilizing intelligent processing has not, at present, achieved indistinguishable level of refinement from that of linkage outline.

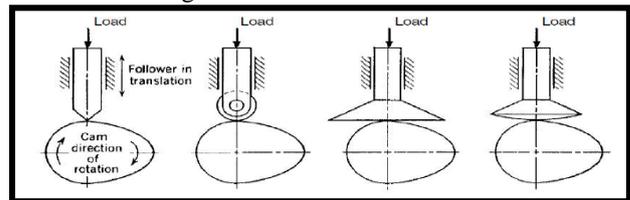


Fig. 3: Types of Cam Follower

A cam and devotee system is a profiled shape mounted on a pole that makes a lever or adherent move. Cams are utilized to change over rotational to direct (responding) movement. As the cam turns, the devotee rises and falls in a procedure known as responding movement. The movement of the adherent is confined to a pre-decided example by a guide. The supporter keeps up contact with the cam through the power of gravity or by a spring. The aggregate scope of development delivered by the cam is known as the stroke. The scope of development of the adherent will rely upon the separation from the pole supporting the cam to the upper and lower purposes of the turn circle. Cams are ordinarily utilized in motors to control valves (in which the valve is the supporter), sewing machines, kids' toys and numerous other mechanical applications.

Cams arrive in an assortment of shapes and sizes - the most well-known composes (from left to right): snail molded, pear formed and a round with an unbalanced opening. As the cams pivot, the supporters respond movement as per the profile of every cam. For instance, cams that have a pear shape will make the supporter lift, to fall and afterward to delay before rehashing the activity. The cams that have a round shape, in some cases referred as eccentric cams, will cause a smooth ascent and fall development with no pause. This is known as harmonic activity.

II. LITERATURE REVIEW

Rahul Pavase et al. [1] studied in their task and they focusing around bottle filling and capping procedure, which must finish in just 2 steps. In present application machine there are three stages for finishing of container pressing procedure. So less time is required when contrasted with present application machine. In their task pneumatic solenoid valve will use for bottle filling and top is fitted by utilizing pneumatic chamber which is fitted at next station. So they decrease the support of the machine and increment the proficiency of the machine, and furthermore increment the creation rate. Such system is intended for particularly to build the proficiency of the machine and lessen the support. In present application machine there are utilized sensors to identify the jug and pass data to subsequent stage for finish the process. In any case, in

new plan machine sensor are not utilized there are to organize the time setting system to educate the following stage for finish the procedure.

Thakare Tushar et al. [2] discussed about Bottle Filling Machine Based on Geneva Mechanism in points of interest. They say that one of the imperative of computerization is in the soda pop and other drink businesses, where a specific fluid must be filled constantly for this sort of utilizations. The pattern is moving far from the individual gadget or machine towards consistent arrangements. Completely incorporated computerization puts this progression into steady practice. Completely coordinated robotization covers the total creation line from receipt of merchandise, the generation procedure, filling and bundling, shipment of products. Our task is likewise a utilization of mechanization wherein we have built up a fluid filling to bottle. The different procedures are controlled utilizing a Geneva instrument. The primary target of the venture is to plan and build up a programmed fluid filling in bottle by utilizing Geneva instrument. To build up a filling machine which can fill distinctive sizes of compartments on the bases of tallness same standard can be utilized in various ventures like medication, oil, concoction businesses for filling fluid to various measured part by a one machine.

Abhinay S. Todmal et al. [3] build up a computerized generation format alongside its plan for topping and water level estimation of a water bottle. The exploration work incorporates planning a apparatus for holding the container, while topping and three-finger self-focusing gripper for putting what's more, moving the container back and forth from guide ways to the jug base holder and the other way around. Proposing a robotized framework and innovation for checking the water level in the jug and viably expelling deficiently filled jugs from collecting line would likewise be one of the targets of this paper. Devices like computerized torque, accuracy ordering transport lines, three-way self-focusing grippers, three jaw hurl (bottle holding apparatus), infrared level discovery sensor have been utilized in this framework. FEA examination of three-finger gripper and three jaw hurl is done to confirm their plan. The segments of this framework are planned utilizing Creo Parametric 2.0. Outlined parts are broke down utilizing ANSYS Workbench 16.0.

Ankur Prajapati et al. [4] have surveyed diverse paper with reference to our venture work. The data looked into in this paper is the nuts and bolts of Geneva instrument, use of Geneva Mechanism and diverse plan criteria for Geneva wheel. This likewise demonstrates the utilization of Geneva in our venture work with the assistance of concentrate diverse application and furthermore applying legitimate plan criteria. The task work conveyed by us is the "Self-loader bar Cutting Machine". By utilizing Geneva Mechanism the discontinuous movement of Geneva will be utilized as a feed instrument for our machine.

Rachit Patel, and Tushar Gundarneeya [5] Experimented with plan and assembling of Geneva wheel with help of laser cutting machines for yank less and moderate movement. Geneva drive is an ordering system that believers precede with movement to discontinuous movement. Because of which paper move's paper is moved between the interims of cutting period. At that point the paper

cutting is accomplished by shaper which is worked with same rpm engine as same as engine which drive the Geneva driving wheel. The shaper will be back its unique position by spring impact or with the assistance of associating bar. So we can get same size paper pieces. This paper piece is move opposite side by ceaseless moving transport to pressing box. With help of various rpm we can get cutting piece and on the base of its quality and cutting time we can discover its effectiveness we can accomplish ideal rpm of cutting a one cycle and accomplish best productivity of machine.

R. Syam Sudhakar Rao et al. [6] studied on the regular punching machine the ideal opportunity for work setting, stamping, punching activity is more. Work cost is likewise more. With Geneva based punching machine the ideal opportunity for work setting, checking, punching, work cost diminishes and furthermore less upkeep cost. In this venture we are planning and manufacturing the model of Auto roll punching machine utilizing Geneva component. This venture is uncommonly intended for programmed punching in metal sheet. This task is to present mechanization in businesses. The real segments associated with this venture are dc engine, cam course of action, chain drive, Geneva instrument and punching device. In this undertaking we are utilizing two rollers for moving the sheet amid activity. A dc engine is associated with cam. The cam has a stick which pivots the Geneva wheel. The Geneva wheel is joined to the chain drive. The opposite end of the anchor drive is associated with the rollers which roll the metal sheet and the punching activity is finished by the punch apparatus. It is appropriate for making large scale manufacturing of the sheet metal punching.

Shailendra Singh and S. Sanyal [7] utilized the development of cam and supporter for decreasing the weight, commotion, vibration, stresses and higher quality in addition to unbending nature for productive and precise activity is going ahead all through the globe since long. The standard materials utilized for Cam and devotee are steel, produced steel, combination steel, aluminum, amalgams and composites. These days, Cam and supporter systems are likewise created from Composite materials or Plastics rather than expectedly utilized metals with higher particular quality and particular solidness and consequently less weight in this way less idleness powers, stresses, diversions, vibrations and commotion. One self greasing up composite Cam-Follower framework requires no oil between the cam supporter and rail along these lines saving money on oil and upkeep henceforth are the best decision for clean-room activities. It is seen from the writing survey that each composite material ingests dampness under high temperature and high dampness condition. Cam and Follower are additionally regularly utilized in outrageous environmental conditions i.e. high temperature and moistness with the prerequisite of exactness and accuracy. In this way, this is an endeavor to discover, Kinematic and Dynamic varieties that will happen in cam and supporter systems made of composite material under aqueous condition. Kinematic examination is done to decide the variety in relocation, speed and quickening. Dynamic investigation is additionally done to discover varieties in idleness compel, spring powers, resultant power and torque of the adherent for the full scope of movement of cam under aqueous condition, made of composite material.

Florian Petrescu and Rely Petrescu [8] introduces a unique technique to decide the efficiency of a component with cam and follower. The creativity of this technique comprises in dispose of the grating modulus. In this paper on dissect three sorts of cam systems: 1.The instrument with revolving cam and plate interpreted devotee; 2.The component with rotating cam and deciphered adherent with roll; 3.The system with rotary cam and supporter with roll. In each sort of cam and supporter system on use an alternate strategy for the best proficiency outline.

III. CONCLUSION

We conclude that the thesis presents an automated liquid filling to bottles of different height using Geneva mechanism. A total control is made in a filling is achieved. The present system will provides a great deal of applications in the field of automation, especially in mass production industries where there are large number of components to be processed and handled in a short period of time and there is need for increased production. The solenoid valve to this system developed is flexible, quickly and easily. This will increase the total production output; this increase in production can yield significant financial benefits and savings. This concept can be used in beverage and food industries, milk industries, medicine industries, mineral water, chemical product industries and manufacturing industries. In future we can implement automatic liquid filling to bottles by using proper mechanism.

We conclude that, this report is about bottle filled by liquid by using Geneva mechanism. This system is used the demand of the product is more is complete the process speedily. This will reduce the time and increase the productivity. This mechanism is used to obtain more profit by less investment. This concept is used in the beverages industries, medical industries and pharmaceuticals industries etc. to fill the bottle.

We conclude that the paper proposes a cost effective and automated model for capping the bottles, and distinguishing and expelling deficiently filled bottle. The different parts talked about in the model are modest and relevantly appropriate for the capacity which they are proposed to perform. Stress examination and distortion investigation of fingers of three-finger gripper and throw of container base holder were finished by ANSYS workbench 16.0. The factor of wellbeing for both the parts was observed to be over two. Hence, this framework would be extremely advantageous to little scale packaging plants with a minimal effort of establishment and setup.

We conclude that the investigation of various utilization of Geneva Mechanism has helped in appropriate usage of an introduction of the instrument. As their undertaking goes for little and medium scales enterprises, the above applications were comparative which encourages us to lessen by and large expense of our venture. On other hand, we have additionally moved to computerization without synthesis of any electronic or advanced circuits.

We can get the discontinuous movement with help of Geneva wheel component having 6 openings and less jerk esteem. It is shift basic in plan and development with the goal that it is apply for little scale businesses for computerization

reason. Exploratory set up or model of machine is composed, built, gathered and afterward use to run the test examine. Programmed cutting machine expel labor with the goal that possibility of blunder are less and creation rate was higher. Additionally we got best cutting nature of paper pieces. These arrangement may apply to numerous little scale ventures for robotization reason.

We conclude that the project is carried out by us is used to make punching on paper and G. I. Sheet with more prescribed than a conventional punching machine. As conventional punching machine takes more time for Job setting, Marking, Punching operation. Labor cost is also more. With this Geneva wheel based auto roll punching machine the time taken for all this process can be reduced and production time also reduced and production rate will be high. No extra skill is required for operating this system. Operation is very smooth and in this system we can get more output by applying less effort. It is very much useful for making series of holes of same diameter and constant pitch. Thus it can be useful for punching application.

A brought together arrangement of composite micromechanics conditions of basic shape is outlined and portrayed. This brought together set can be utilized to foresee unidirectional composite (employ) geometric, mechanical, warm and hydra properties utilizing constituent material (fiber/framework) properties. This bound together set likewise incorporates rough conditions for anticipating (1) dampness assimilation; (2) glass progress temperature of wet pitches; and (3) aqueous corruption impacts. These conditions exhibit the interrelationship of the different variables (geometric to natural) and help give knowledge into composite conduct at the miniaturized scale mechanical level. In kinematic investigation of cam and supporter instrument, it is seen that the relocation, speed and quickening changes on account of variety in pitch hover range of cam due to aqueous development. In powerful examination of Cam and devotee component under aqueous condition, it is seen that mass of Cam and supporter expands hence latency powers improve which prompts upgrade in Resultant powers in this manner higher torque. Because of retention of dampness volume will improve and thickness and mass will likewise build accordingly mass snapshot of dormancy of cam and adherent additionally upgrades Contact stresses can be finding under the aqueous condition and check the variety in contact worries under aqueous environment. Modal examination can be performed under aqueous condition of the cam and supporter. As per requirement we can use cam and follower.

We conclude that the follower with roll, make input-force, to be divided in more components. This is the motive for that, the dynamic and the precisely-kinematics of mechanism with rotary cam and follower with roll, are more different and difficult.

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REFERENCES

- [1] Rahul Pavase, Siddheshwar Sawant, Kailas Pawar, Vishal Harale, Ashwin Dharme, "Bottle Filling and Capping Using Geneva Mechanism", International Journal on Theoretical and Applied Research in Mechanical Engineering (IJTARME), Volume 7, Issue 1, February 2018.
- [2] Thakare Tushar, Kudale Nikhil, Pangare Ankur, Kolpe Hrushikesh, Prof. D.U. Patil, "Bottle Filling Machine Based On Geneva Mechanism" International Journal of Recent Research in Civil and Mechanical Engineering (IJRCME), Volume 2, Issue 1, April 2015 – September 2015.
- [3] Abhinay S. Todmal, Syed Bilal Quadri, Praneeth Narasimman, "Propose & Design an Automated Mechanical System for Capping and Water Level Measurement of Water Bottle" Department of Mechanical Engineering of University of Bridgeport.
- [4] Ankur Prajapati, Chinmay Patel, Dhwanit Pankhania, Brijen Kanjia, Aakash Dubey, "Review On Geneva Mechanism And Its Application", International Journal of Advance Engineering and Research Development (IJAERD), Volume 4, Issue 2, February 2017.
- [5] Rachit Patel, Tushar Gundarneeeya, "Analysis and Synthesis of Geneva Wheel for Automation of Conventional Paper Cutting Machine", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 5, Issue 4, April 2017.
- [6] R. Syam Sudhakar Rao, A. Hari Tej, C. Siva Sai, A. Rupesh Kumar, A. Narayana Reddy, B. Sai Krishna, "Design Of Geneva Wheel Based Auto-Roll Punching Machine", International Research Journal of Engineering and Technology (IRJET), Volume 4, Issue 3, March 2017.
- [7] Shailendra Singh, S. Sanyal, "Kinematic and Dynamic Variations in Cam and Follower Made of Composite Material under Hydrothermal Environment", International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), Volume 6, Issue 3, March 2017.
- [8] Florian Petrescu, Rely Petrescu, "The Cam Design For A Better Efficiency", International Conference on Engineering Graphics and Design (ICEGD) -Bucharest, Romania, 2005.