

# Five Acting Punching Machine: A Review

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**Abstract:** Now a days various type of mechanism available for punching operation, to improve the efficiency in punching process we will make a new mechanism for Punching "FIVE ACTING PUNCHING MACHINE" this mechanism is give the motion to five different punch at same time, by this machine we get five Different Punching motion at one revolution of motor or prime mover.

**Keywords:** Punching, Multiple Punch, Sheering Effect, Fracture.

## 1. Introduction

Punching or pressing process is one of the most important and necessary processing step in sheet metal industry. This project is specially designed for automatic multiple punching in work piece. As the name shows that machine manufacture punch (die-cut holes). A powder or granule is prepared, in this process leaves a hole in the metalwork piece, Its ability to produce economical ejected holes in sheet metal during production processes In our machine different types of Punch's are manufacture at the same time. By the 5 acting piston cylinder compression force is produce and this mechanism is use to compress the powder and PUNCH is produce. Punching is a method of confectionery manufacture that shares many similarities with PUNCH (blanking) production. Re-present the fastest and more efficient way to form a metal into a finished punched product. The manufacture of presses are exclusively intended for mass production.

## 2. Literature review

### A. History of punching machines

Punching is forming process that use a punch press to force a tool, called punch, through the work piece to create a hole via shearing. punching is applied to wide variety of material that come in sheet form, including sheet metal, paper, vulcanized fiber and some form of plastic sheet. The punch of tern passes thought the work into a die. A scrap slug from the hole is deposit into the die in the process. Depending on the material being punched this slug may be recycled and reused or discarded [5]. Punching is often the cheapest method for creating holes in sheet materials in medium to high production volumes. When specially shaped punch is use to create multiple usable parts from a sheet of materials the process is known as blanking. In metal forging application, the work is often punched while hot and this is called hot punching. Slugging is the operation of

punching is stoped as soon as the metal fracture is complete and metal is not removed but held in hole [5].

### B. Foreign inventions

A German inventor designed the first ever hole puncher (also known as hole punch) of its kind in 1886. Frederick So Mencken created a type of office tool capable of punching small holes in paper. He applied for a patent in Germany and was awarded one on Nov. 14, 1886. He called the machine Papierlocher fur Sammelmappen and the device was simply called a hole punch. His invention led to designers in other countries, such as the United States, working on creating a better version [3].

### C. First U.S. patent

The first patent for a hole puncher in the United States was given to Benjamin Smith, a man working in Massachusetts. Smith worked with different tools and tried different designs before coming up with the idea of a hole punch. His design used two metal pieces with a hole in the bottom piece and a sharp cutting implement on the other end. The two pieces were attached using a spring that gave the punch strength to work through a piece of paper. Smith referred to the punch as a conductor's punch when he was granted patent number 313027[3].

### D. 20th century advances

Throughout the 20th century the traditional hole punch retained much of the same look of the early models including the metal construction. After some work, hole punches took on the look of pliers and were easier to carry. Toward the end of the century there were even a few plastic versions released, though with the cutter itself still made of metal. It was during this time that manufacturers also released versions that used a shape in the cutter other than a circle, such as a square, star or heart design.

### E. 21st Century

The United States Patent Office has recorded several patents for new hole punches since 2000. One of these uses a pressure plate and stacked rings, which allow the hole punch to punch through stacks of paper easier, without the user exerting a lot of force. Another hole punch uses manual lever spacers that allow the user to change the size of the holes and the spacing of the holes. This design is used by manufacturers like Swing line and Lever hand.

*F. Effect of step punch on punch life in punching of ultra-high strength steel sheet*

- The punching conditions with the step punch are show in fig. the punch having the step height width  $b$  was used. The diameter and the profile radius of punch were 10mm and 0.2mm respectively. For comparison, the punch without step and the profile radius were use. The clearance ratio between the punch and die were 15 to 25 %. The material properties of the ultra-high strength steel sheet having a nominal tensile strength of 980 MPa are given in table [1].
- The punch load-strock curve for  $h=1$  and  $b=0.5$  mm is show in fig. the maximum punch load with the step is same as that without the step , whereas the punch strock with the step is longer than that without the step due to the step height [1].

Table 1  
Material property of ultra-high strength steel sheet

Steel sheet	980 mpa
Ultimate tensile strength[MPa]	1035
Elongation[%]	16.2

*Problem Identification*

- In conventional Punching Machine, The job is to be marked.
- The sheet is to be aligned and fed manually for every punched hole.
- Lead time of system is more due to manual feeding.
- The safety of worker is at stake.
- Requires higher material handling time

**3. Working principle**



Fig. 1. Working principle

When we start motor the pentagonal disc will rotate which is fixed with shaft. The angle on which it will rotate will be decided as well as angle is set the motion. Motion will be converted into reciprocating motion. So the five punches which is connected to five corner of pentagon. This five different type punches act at same time in one revolution of motor.

**4. Literature review**

Since a decrease of the fatigue strength may result from punching operations, this study proposes a methodology for designing punched parts against high cycle fatigue crack

initiation. To reach this goal, high cycle fatigue tests are performed on different specimens configurations with either punched or polished edges. Due to punching effects, the fatigue strength of punched specimens is significantly decreased. Fracture surfaces observations reveal that crack initiation occurs always on a punch defect. Additional investigations are combined to characterize how the edges are altered by the punching operations. High tensile residual stress levels along the loading direction are quantified using X-Ray diffraction techniques. Furthermore, micro-hardness measurements and X-Ray diffraction results reveals a strong hardness gradient due to punching operation. For a better understanding of crack initiation mechanisms, the edge geometries have been scanned with 3D optical microscopy, allowing us to identify the most critical defect (and its real geometry) by comparing the edges before and after fatigue failure. Finally, FEA are performed on identified defects. A non-local high cycle multiaxial fatigue strength criterion has been used as post-processing of FEA to take into account the effect on the HCF strength of defects and the strong stress-strain gradients around them.

Elsevier B.V. on behalf of Shenyang Pharmaceutical University. Previously determined “Tableting properties” by using a multi- functional single-punch tablet press (GTP-1). We proposed plotting “compatibility” on the x-axis against “manufacturability” on the y-axis to allow visual evaluation of “Tableting properties”. Various types of tableting failure occur in commercial drug production and are influenced by the amount of lubricant used and the shape of the punch. We used the GTP-1 to measure “Tableting properties” with different amounts of bricant and compared the results with those of tableting on a commercial rotary tableting machine. Tablets compressed with a small amount of lubricant showed bad “Manufacturability”, leading to sticking of powder on punches. We also tested various punch shapes. The GTP-1 correctly predicted the actual tableting results for all punch shapes. With punches that were more likely to cause tableting failure, our system predicted the effects of lubricant quantity in the tablet formulation and the occurrence of sticking in the rotary tableting machine. A new standard is currently being developed under the auspices of ECISS/TC 101 WG1 for the small punch Testing technique for the estimation of both tensile and creep properties. Annex G of the new standard is covering the assessment and evaluation of small punch creep (SPC) data. The main challenge for estimating uniaxial creep Properties from SPC data is the force to equivalent stress conversion between SPC and uniaxial creep tests. In this Work a range of SPC assessment methodologies, benchmarked for the standard, are compared for verifying the Best practice used in the standard. The estimated equivalent stresses for SPC are compared to uniaxial creep Stresses at equal rupture times, using three alternative models. In-depth analyses are performed on SPC and Uniaxial creep data for P92, F92 and 316 L steel tested within an inter-laboratory round robin. The formulation For SPC equivalent creep strain rate in the standard is also assessed.

The punch with a step was applied to improve the punch life in punching of ultra-high strength steel sheets. The contact

pressure in punching with the step was reduced due to the early separation of the sheet under tension. Punching with the step punch was carried out for 7000 times in stroke, whereas chipping in the punch occurred at 3000 times in punching without the step. Then, punching with the step punch was applied to the quenched steel sheet to prevent the occurrence of the delayed cracking of the sheared edge. The delayed cracking occurred, although the residual stress in the sheared edge decreased with increasing the step height. Furthermore, shearing. With the step, punch was applied to improve the stretch-flange ability of the ultra-high strength steel and high strength steel sheets.

### 5. Conclusion

We have understood the working principal of punching machine. After surveying such review papers we able to conclude and observed that in traditional method of punching operation that Requires higher material handling cost as well as time which increase's manufacturing Lead time of system. Thus, we obtain the Five acting punching machine requires comparative less material handling cost and time. Probability of accident is very less in machine is also safe for operator.

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