DESIGN AND DEVELOPMENT OF GOLD BRACELET STAMPING DIE

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DECLARATION

I declare that this thesis entitled “Design And Development of Gold Bracelet Stamping Die ” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name : Muhd. Afiq Hafizuddin Bin Azman

Date : 28 January 2022

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours.

Signature : ....

Supervisor Name : Ts. Hassan Bin Attan

Date : ....

DEDICATION

This report is dedicated first and foremost to my beloved parents, for their endless love, support and encouragement. To my lecturer Ts. Hassan Bin Attan, who guided me along the way to complete this project. Thank you for all your support and give me strength till this project is completed.

ABSTRACT

On gold bracelets, many goldsmith workshops in Malaysia use traditional handcrafting techniques. Because the jewellery manufactured in these factories is usually heavy and time-consuming to make, the expense and thus the pricing are relatively high. As a result, goldsmiths require tools that can mass-produce gold bracelets in order to meet market demand. This study will employ locally available materials and establish studio processes that goldsmiths may use to translate their designs into stamping dies that can be used to mass produce lightweight, three-dimensional design parts. Within qualitative research, the study blended industrial-based research and descriptive research approaches. Practicing goldsmiths in Malaysia were the study's target population. The study's accessible population consisted of a few Malaysian goldsmith businesses. Many motifs and images that symbolise Malaysian culture might be translated into dies and punches to create gold bracelets, according to the study. As a result, goldsmiths should build basic tools like dies and punches in the workshop using a press machine in order to produce high quality and mass manufacturing.

Keywords: Gold bracelets, stamping dies, dies and punches

ABSTRAK

Pada gelang emas, banyak bengkel tukang emas di Malaysia menggunakan teknik kraftangan tradisional. Oleh kerana barang kemas yang dikeluarkan di kilang-kilang ini biasanya berat dan memakan masa untuk membuat, perbelanjaan dan dengan itu harganya agak tinggi. Akibatnya, tukang emas memerlukan alat yang boleh menghasilkan gelang emas secara besar-besaran untuk memenuhi permintaan pasaran. Kajian ini akan menggunakan bahan-bahan tempatan dan mewujudkan proses studio yang mungkin digunakan oleh tukang emas untuk menterjemah reka bentuk mereka ke dalam cetakan cetakan yang boleh digunakan untuk menghasilkan bahagian reka bentuk tiga dimensi yang ringan secara besar-besaran. Dalam penyelidikan kualitatif, kajian ini menggabungkan pendekatan penyelidikan berasaskan industri dan penyelidikan deskriptif. Mengamalkan tukang emas di Malaysia adalah populasi sasaran kajian. Populasi yang boleh diakses oleh kajian ini terdiri daripada beberapa perniagaan tukang emas Malaysia. Banyak motif dan imej yang melambangkan budaya Malaysia mungkin diterjemahkan ke dalam bentuk mati dan tumbukan untuk mencipta gelang emas, menurut kajian itu. Akibatnya, tukang emas harus membina alat asas seperti die dan penebuk di bengkel menggunakan mesin penekan untuk menghasilkan pembuatan yang berkualiti tinggi dan besar-besaran.

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LIST OF SYMBOLS AND ABBREVIATIONS

N	-	Newton
kg	-	Kilogram
mm	-	Millimeter
m^3	-	Cubic metre
m^2	-	Square metre
kN	-	kiloNewton

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CHAPTER 1

INTRODUCTION

1.1 Background

Metal stamping is a cold-forming process that makes use of dies and stamping presses to transform sheet metal into different shapes. Pieces of flat sheet metal, typically referred to as blanks, is fed into a sheet metal stamping press that uses a tool and die surface to form the metal into a new shape. Production facilities and metal fabricators offering stamping services will place the material to be stamped between die sections, where the use of pressure will shape and shear the material into the desired final shape for the product or component.

Metal stamping, also referred to as pressing, is a low-cost high-speed manufacturing process that can produce a high volume of identical metal components. Stamping operations are suitable for both short or long production runs, and be conducted with other metal forming operations, and may consist of one or more of a series of more specific processes or techniques such as punching, blanking, embossing, coining, bending and flanging.

Based on the title which are design and development of gold bracelet stamping die, we mainly focused on the tool that have been used for the production of gold bracelet. There are many types of stamping operation that have been used on the production of the gold bracelet based on the design and shape of the product. Generally, some of the familiar process that always been used on the gold bracelet production are punching, blanking, embossing and bending. One of the famous types of tool that have been used was progressive stamping die tool which were suitable for low-cost and high-speed production.

1.2 Problem Statement

Gold which known as a jewellery materials popular for it's precious metals are sold mainly by the weight; therefore if the precious metal weight of jewellery is high, the overall cost is also high. For this reason, many people are unable to afford precious metal jewellery because of very high market prices. However, the cost and for that matter the final unit price of jewellery, can be lowered by reducing the weight. This can be achieved by employing cost effective tooling technique in the production process such as the usage of dies and punches. This is significant because in the gold industry, the technique which is used to produce articles has a direct bearing on the cost of the finished product.

However, many jewellery workshops rely on traditional hand fabrication techniques including piercing and cuttlefish bone casting for making gold jewellery. Jewellery items produced by these outfits are generally heavy or flat and the methods of production are not mass production friendly. Reduction of the unit weight of precious metal jewellery through the use of dies and punches should result in the decrease of the unit price of jewellery. One way of reducing the unit weight is by making the jewellery pieces thin walled and hollow while also ensuring good strength and high quality design.

In spite of the numerous benefits that can be derived from the use of dies and punches in jewellery production, a survey carried out by the researcher has revealed that currently gold jewellery producers are not employing this forming method because they do not have any knowledge about them. In this regard, there is need for research to explore locally accessible materials including tools and equipment, to develop methods at the studio level and produce samples of dies and punches to serve as a blue print to be by the goldsmith. This is to enable them convert their designs into embossing dies and punches suitable for mass production of light weight.

1.3 Project Objective

The objectives of this project are as follow:

1. Study and analyse the properties of gold bracelet stamping die.

2. Design and develop drawing of gold bracelet stamping die.

3. Produce a prototype of gold bracelet stamping die by using 3D printer.

1.4 Scope of Project

The scope of this project are as follows:

- Develop the most suitable stamping die tool of gold bracelet for industrial use.
- Design a proper and detail drawing for stamping die tool of gold bracelet for industrial use.
- Study on consideration to figure the most suitable type of material used to produce a stamping die tool for gold bracelet.
- Figure the most suitable standard tool to produce the stamping die tool based on the drawing specification.
- Enhance the product quality of gold bracelet by reducing the number of scrap for low-cost and high-speed mass production.
- Invetigate on how to reduce the time consumption of gold bracelet production to increase the production.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

To understand and clarify clearly the problem on how to design and fabricate of gold bracelet stamping die, certain factors have been reviewed to accomplished the objective. These factors are:

i. Concept of design

ii. Concept of embossing

iii. Concept of Dies

iv. Materials used for die/punch manufacturing

v. Types of dies

vi. Methods of die/punch production

vii. Usefulness of Dies and Punches.

2.2 Concept of Design

Design plays an important role in an innovation in all types of fileds of artistic study whether in enginering or other fields of sector. In jewellery, or we can say in bracelet specifically, design is not much different from other plastics arts such as sculpture and ceramics because in all fields of arts, planning preceds execution of the medium.

Amenuke et al (1991) consider a design as a process or the result of a process. This means that design can be understood in two ways: (1) as a process and (2) as a final product. When a designer plans his or her work, he or she puts together certain qualities such as point, line, shape, and colour, and it is the relationship of these qualities that the viewer sees. These qualities, sometimes referred to as the elements of design according to Amenuke et al, are the fundamental part or qualities of any design.

Untracht (1985) also shares Amenuke et al.'s view of design, noting that design in relation to jewellery can be described as an intellectual or intuitive concept (both can operate simultaneously) in which purposeful planning or mental imagery determines the way in which materials are used and arranged in a relationship of shapes, forms and surface treatments to create an integrated object.

According to Untracht, the form of the material itself may suggest a process, since any form of metal embodies a natural range of possible treatments that inspire design. He acknowledges, however, that superimposed on the basic concept of a material's original form and character in relation to process are those considerations of composition and organisation known as formal design elements, perhaps better known as design components, since it is through their use that an object is composed. Untracht adds that these elements and the above considerations, no matter how limitedly used or isolated for discussion purposes, are dynamically linked in the creation of a design in a highly flexible way, in fact one aspect can hardly be mentioned without including another.

Untrcaht again explains that designing and creating a piece of gold bracelet is a reciprocal process of synthesizing the intangible into reality. This is essentially done through a sequence of judgments, decision making, and problem solving, all of which occur when materials are made into forms.

Unless the design concept is of such a nature that it can be captured in a drawing with mathematical precision and implemented without changes in the graphic representation. When designing bracelet, in addition to the design components and the shape of the material, which should be highly considered, another critical factor that must be given ultimate attention is how the design will harmonise with the human body. This is based on the form that a bracelet design takes and functional considerations of a design.

It may be inferred from the above design that in the creation of bracelet, until the final measurements for the parts of a design have been fixed and strictly adhered to, new ideas may be added in the course of working the materials into bracelet forms.

Untracht(1985) believes that the size of a piece of bracelet a person chooses to wear is directly related to the motives the person may have for wearing the bracelet. He agrees that in cases where a large mass is desired, the weight may be reduced and the mass increased by making hollow forms. He concedes that while weight tolerance is an individual issue having to do with personality differences, it is also a matter of economics when using precious metals. He reiterates the view that the greater the weight, the higher the cost and the final price. As a solution to this problem, he adds that the control of weight lies primarily in the particular choice of materials and thickness of the bracelet pieces. He goes on to say that of importance is the system of construction: solid, cast forms weigh considerably more than barcelet made from hollow, low forms.

The author agrees with the views of the authors that design components and material forms are undeniable factors that should be given due attention in jewellery design, but equally important are the cost of materials and the sale of the final product. This is one of the reasons why the design of dies and stamps to be used in the design of lightweight bracelet is the focus of this study.

2.3 Concept of Embossing

Embossing is a method of creating raised shapes on a metal surface. The raised form produced can be used either as an intaglio or a cameo, depending on the purpose the metal artist wishes to achieve with the form. According to Muldoon (2008), metal embossing adds lustre, radiance, intriguing dimension and texture to metal.

Rajput (2007) explains that stamping is used as an operation in making recessed figures on metal sheets with corresponding relief on the other side. The metal flow is in the direction of the applied force. The forces required are much less than in embossing.

Burto (1963) also states that the main raw material required for embossing is soft sheet - brass, copper, or aluminium between 0.005 and 0.010 inch thick. He relates that normal copper or brass sheet must be annealed before it can be stamped, and this is done by heating the metal until it glows red; it is then cooled in air or "immersed" in water.

The actual minting process, he continues, is conceivably simple. It begins by stretching the annealed piece of sheet metal over the die and striking it with the padded hammer. This forces the metal down into the openings of the die and reproduces the pattern in the die. According to Muldoon (2008), metal stamping is an art form that has been around for centuries. A variety of easy to use tools are used to press flat metal sheets from behind to create designs.

Untracht (1985) describes embossing as an act of stamping to push out a shape in cameo or intaglio. This process, according to him, is done with the help of an embossing die or punch. If the resulting shape is positive or in high relief, it is called a cameo (from the Italian cammeo "a gem carved in relief"). If the shape is negative or concave, it is called intaglio (from Italian intaglire, "to engrave, cut, or carve a pattern into a substance below its original surface"). For sheet metal, these shapes can be used with the positive or negative side up. The moulded shape may be relatively small - as in a small, hand-made embossing die - and the resulting boss is usually one of a number of such elements placed in an array on a still intact sheet.

The researcher agrees with the author in the above assertion that the embossed form can be used as a unit and this means that it can be added to other elements to form a whole ornament, or an embossed form could stand alone as a complete ornament.

From the above distinction between stamping and embossing, it is clear that the end product of the latter gives a shape to a blank, while the former gives a form. Embossing on metal is accomplished by the application of force, and the resulting shapes may be used with the positive or negative side up.