COMBINING RAISING AND SPINNING TECHNIQUES IN HOLLOW WARE FORMING

By

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A Thesis submitted to the Department of Industrial Art,
Kwame Nkrumah University of Science and Technology
In partial fulfilment of the requirement for the degree of

MASTER OF FINE ART
(Jewellery and Metalsmithing)
Faculty of Industrial Art, College of Art and Social Sciences

May, 2009

DECLARATION

I hereby declare that this submission is my own work towards the MFA and that to the best of my knowledge, it contains no materials previously published by another person nor materials which has been accepted for the award of any other degree of the University, except where due acknowledge has been made in the text.

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ABSTRACT

Title: Combining Raising and Spinning Techniques in Hollow Ware Forming

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Supervisor: Mr. E.Y. Ansah

Raising, a studio technique in metal forming has not been given much attention by metalsmiths. Spinning, an industrial technique for metal forming is adaptable for studio work but most craftsmen or metal smiths shy away from this technique since they believe it makes them less professional. However, the technique has interesting possibilities, and the aim of this researcher is to find out how well spinning (an industrial technique) can be combined with raising (a studio technique) to influence the development of hollow ware. Qualitative method of research was used for this research. The whole study was experimental and the descriptive research method was used in the study to review related literature and to describe the various techniques and processes used in the project. Data for the research was collected using interviews and observation as well as the internet and library. The project was successful and the results were discussed under the intellectual, social, cultural, philosophical and artistic contexts. The project works were executed based on the theme "Passion for gourd".

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ACKNOWLEDGEMENT

I wish to express my deepest sense of gratitude to the Lord Almighty for giving me the strength to start and finish this project successfully. I am extremely grateful to my supervisor Mr. E.Y. Ansah for his patience, motivation, support and supervision which made this project become a reality. Special thanks also go to Mr. K.A. Asomaning, and all the lecturers of the Metal Product Design Section for their advice and support given to me during the course of this project.

My profound gratitude goes to my father Mr. Elvis R. Adala (Elvis Best) and my mother Mrs. Claudia G. Adala for their immense financial, emotional and most of all their parental support given me throughout my six years of study of KNUST.

I wish to acknowledge the encouragement and emotional support given to me by Mrs. Dorothy Amenuke, Mr. Patrick Turkson, Mr. Amenyo Dzikunu-Bansah, and Mr. Bernard A. Jackson.

My sincere gratitude also goes to Mr. Lawrence Bruce Kyei, Mr. Emmanuel Mensah, Mr. Asiwome Opare and Miss Gifty Ama Gabienu for their special contribution towards the success of this project.

Finally I wish to thank all the students of the Metal Product Design Section for their motivation and pieces of advice that made this project a success.

CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

Over the years, metal artists have used various techniques in forming metal products to enhance their aesthetic and utilitarian values. These methods are often simple, ranging from skilful studio forming techniques to industrial techniques. Most of the techniques are being used intensively across the world. However, even though spinning is being used by most of the aluminium processing companies in the country for the production of aluminium bowls and utensils, a preliminary investigation of this study reveals that "raising" a studio technique in metal forming has not been given much attention.

The artist has always lived with the belief that intellectual curiosity is the life blood of real civilization. With this curiosity in mind, a study of a ceramic piece that was produced by a combination of throwing and hand-forming technique one day triggered the idea that it could be possible to combine the raising and the spinning techniques to form metal vessels.

1.1 Statement of the Problem

There are many techniques used in the production of metal artefacts. These include forging, welding, chasing and repoussé, embossing, soldering, raising, spinning, etc. Some of these processes are being used intensively in the industry for metal forming. The spinning technique is adaptable for studio work but most craftsmen or metal smiths frown upon this technique since they believe it makes them less professional. However, the technique has interesting possibilities, and the aim of this researcher is to find out how well spinning (an industrial technique) can be combined with raising (a studio technique) to influence the development of hollow ware.

1.2 Objectives of the Study

1. To discuss the nature of raising and spinning techniques.
2. To explore the raising and spinning techniques in hollowware forming.
3. To design and produce hollowware by using a combination of raising and spinning techniques of metal forming.

1.3 Research Methodology

Experimental and descriptive research methods were the main methods employed in the study.

1.4 Research Instruments/Tools

Observation and photographic documentation were employed for the data collection.

1.5 Importance of the Research

This project is aimed at boosting the confidence level of people who intend to practice silversmithing, especially those who wish to specialize in developing hollowware. The idea created in this project is to make hollow ware forming a little much easier than the traditional approach where hollow ware was formed on a stake by hammering a flat sheet of metal into the required and shape which takes so much time. The project results are also a good educational material for research institutions, metal students, NGOs and industries.

1.6 Facilities available/Sources of information

1. The Metal Product Design Studios
2. The World Wide Web (Internet)
3. The libraries of KNUST
4. British Council Library, Kumasi
5. Ashanti Library, Kumasi
6. Resource Persons
7. Digital camera

1.7 Delimitation

The scope of the research would cover the designing and production of hollowware using mainly the spinning and raising techniques.

1.8 Limitation

Limitations encountered include the following:

1. Lack of funds: This is because the materials used were quite expensive so the researcher could not produce the intended number of works.
2. Availability of materials: It would have been a great joy for the researcher to produce some of these works in silver or brass but the materials were not available in sheet forms on the market.
3. The researcher's lack of wood turning skills which is very important for spinning also posed a great difficulty as the local wood turners had a difficult time turning wood to precise dimensions.

1.9 Definition of Terms

Annealing: The heat treating (softening) of metal after it has been work-hardened with steel tools, and is necessary between raising and forging stages. Annealing is also used to remove tension in a piece of metal before brazing, helping to reduce warpage.

Chasing: While repoussé is used to work on the reverse of the metal to form a raised design on the front, chasing is used to refine the design on the front of the work by sinking the metal. The term chasing is derived from the noun "chase", which refers to a groove, furrow, channel or indentation.

Forging: This is the term used for shaping metal by using localized compressive forces or simply put, shaping metals by hammering.

Lathe: It is a machine tool which spins a block of material to perform various operations such as cutting, sanding, knurling, drilling, or deformation with tools that are applied to the workpiece to create an object which has symmetry about an axis of rotation.

Mandrels: The mandrel/chuck can be made from wood, steel alloys, or synthetic materials. The choice of material is dictated by the hardness of the material to be spun and by how many times the tool is expected to be used.

Piercing: The use of a saw frame and blade to create shapes from sheet metals.

Pickling: It is a treatment of metallic surfaces in order to remove impurities, stains, rust or scale with a solution called pickle liquor, containing strong mineral acids, before subsequent processing, such as extrusion, rolling, painting, galvanizing or plating with tin or chromium. The two acids commonly used are hydrochloric acid and sulphuric acid. Pickling liquor may be a combination of acids and may also contain nitric or hydrofluoric acids.

Planishing: It is a metalworking technique used to smooth sheet metal. After a piece of metal has been roughly formed by techniques such as sinking or raising, the surface will have irregular indentations and bumps. To remove these imperfections, the piece is hammered between a flat or slightly curved hammer and a special forming object known as a planishing stake.

Polishing: The process of refining a metal surface by use of a polishing wheel attached to a long-spindled motorized arbor which runs at high speed. Various finishes may be obtained with a wide variety of abrasive compounds applied to the polishing wheels such as rouge compound imparts the brightest finish. Other compounds will produce matte finishes, emphasizing the form since which will be rendered less reflective.

Raising: It is a metalworking technique whereby sheet metal is formed into a bowl or other hollow object by repeated sequences of hammering and annealing of the metal, thereby stretching it into the desired shape.

Repoussé: It is a metalworking technique in which a malleable metal is ornamented or shaped by hammering from the reverse side.

Soldering: This is a process in which two or more metal items are joined together by melting and flowing a filler metal into the joint, the filler metal having a relatively low melting point. The filler metal used in the process is called solder.

Spinning: Spinning, or spin forming, is a metal working process by which a disc or tube of metal is rotated at high speed and formed into an axially symmetric part using tools

Stakes: Any polished cast iron or steel tool placed in a vice and is used for forming and planishing metal over. This tool is generally large enough to be used without a horse.

Welding: It is a fabrication process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler material to form a pool of molten material that cools to become a strong joint, with pressure sometimes used in conjunction with heat, or by itself, to produce the weld.

Woodturning: This is a form of woodworking that is used to create wooden objects on a lathe.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

The previous chapter presented the problem and its settings as well as the set objectives. The present chapter provides the theoretical support for the project. It delves into the various definitions of raising and spinning, as well as history, and examines various extents to which artists have explored raising and spinning in the forming of hollow ware. The chapter reviews literature relevant to the objectives of the project under the following sub-titles:

- Raising
- History of Raising
- Types of Raising
- Spinning
- History of Spinning

2.1 Raising - Definitions

McCreight (1991) describes raising as an ancient and basically unchanged technique which is a foundation stone of metalsmithing in all cultures and all times. He added that it requires only a hammer and a solid form against which the metal is bent.

Siegner (1961) defines raising as a forming process in art metalwork where the sides of the metal are formed to give shape to the work. He added that the bottom of the project can be either rounded or flattened.

A group of metal artists, Finegold, Rupert and Seitz (1983), are also of the view that, raising is a metalworking technique whereby sheet metal is formed into a bowl or other hollow object by repeated sequences of hammering and annealing of the metal, thereby stretching it into the desired shape. They also stated that the technique was used in creating medieval plate armour, and is also used to create fine silverware.

In support of the above, Knauth (1974) agrees by adding that, raising is a technique where a plain, flat piece of metal can be transformed into a vessel of almost any shape.

2.2 The History of Raising

In finding out the genesis of raising, Knauth (1974), asserts that the raising technique was invented around 3000 B.C. in Sumer where the method yielded objects that were pleasing to look at and touch, yet lightweight and strong. He also stated that the basic material used was an unadorned disc of metal which in early times would have been produced by melting the silver and casting it as a flat ingot; perhaps between two slabs of stone or baked clay and then hammering it into the desired shape.

To add to the above, McNab (2006) states that by 2500 BC, at least all the main techniques for working metals had been very slowly pioneered in the treatment of copper. He continues that by that time these techniques were already being applied to other metals, such as silver, gold, and natural alloys of electrum and bronze and the techniques used for shaping were hot and cold forging or beating, which developed into hammering and raising techniques, using smooth hematite hammers.

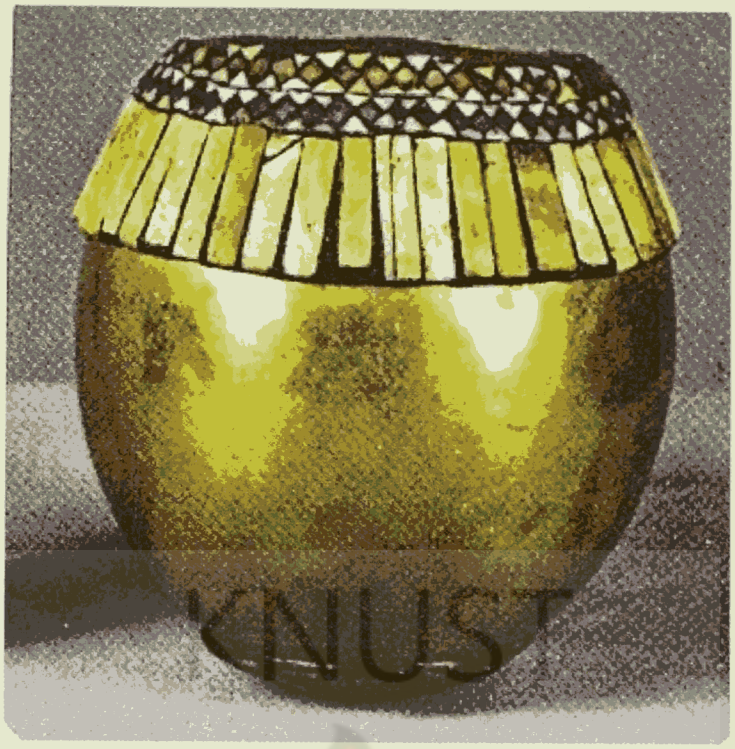


Plate 2.1: An old gold cup produced by raising
Source: Microsoft Encarta 2006. Microsoft Corporation CD Rom

The photograph presented in plate 2.1 above was shown by McNab(2006) as an example of a gold cup in the shape of an ostrich egg from a 2500 B.C. Sumerian grave which is a three-dimensional object raised from a flat disc. He also described the cup as having been decorated with checks of lapis lazuli, red limestone and shell and a fringe of shell strips and the cup stands just 12.7cm '5 inches' high.

2.3.0 Types of Raising

Generally, raising can be classified into two. These are:

1. Anticlastic raising

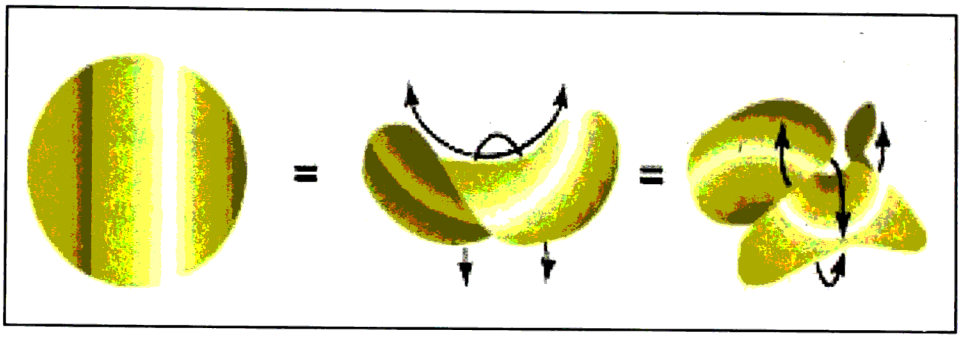


Figure 2.1
Source: http://en.wikipedia.org/wiki/Raising_(metalwork)

2. Synclastic raising

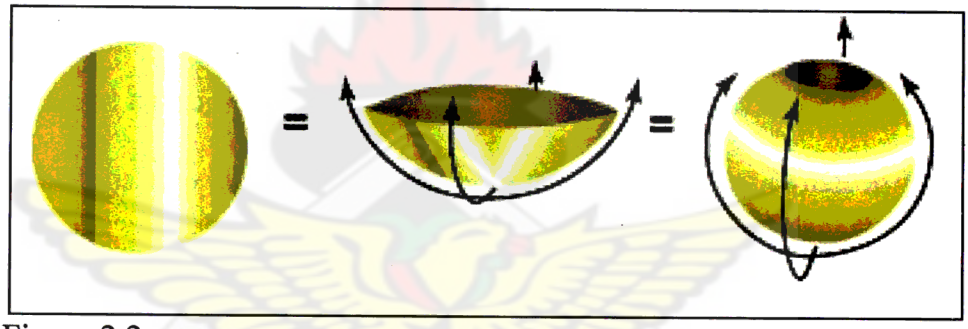


Figure 2.2
Source: http://en.wikipedia.org/wiki/Raising_(metalwork)

2.3.1 Anticlastic Raising

According to Scavezze (2005), Anticlastic raising is a process by which metal is deformed by the use of polished hammers and plastic mallets of various sizes and shapes. Anticlastic refers to the direction in which the metal is deformed. On a flat sheet of metal draw two axes at 90 degrees to each other. If you were to then bend one of them up and the other down you would have an anticlastic shape. If both of the axes were bent in the same direction you

would have a synclastic shape. A synclastic shape is shaped like a bowl and an anticlastic shape has a saddle shape.

McCreight (1991) also added that, in this variation of raising, an upward curve in one axis is countered by an opposite curve on the right angled axis (the curves of the two major axes travel in opposite directions). He continued that the result is a structurally rigid form with a vast vocabulary of possibilities.

Good and Aurum (1999) also described the Anticlastic Raising process as a technique of metal forming whereby sheet metal is formed directly with a hammer on a sinusodial (snake-like) stake. They continued that a flat sheet of metal is shaped by compressing its edges and stretching the centre so that the surface develops two curves at right angles to each other as shown in figure 2.1, not leaving out the fact that the pattern of the sheet plays a major role in the form that will be achieved. However, many different forms can often be made from the same pattern.

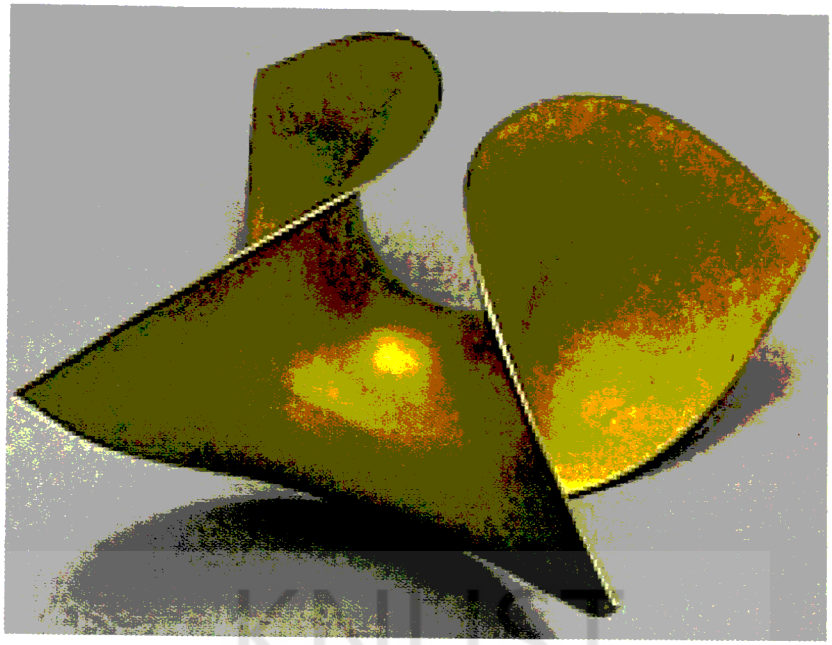


Plate 2.2: A classic anticlastic-raised form is illustrated in this gold object

By Michael Good

Source: http://en.wikipedia.org/wiki/Raising_(metalwork)

2.3.2 Synclastic Raising

According to Goods (1997), metal smiths throughout the centuries have used the synclastic metal raising process to create useful objects such as bowls. He continues further that, in the simplest type of synclastic raising, hammers are used to stretch the centre of a sheet of metal, while compressing the edges so that they fold inward toward the centre, creating a bowl-like form.

Also from the archives of Wikipedia the free encyclopedia, Krause(2006) comments that, in synclastic raising sometimes referred to as traditional raising, the dominant curves of the object being forged are at right angles and move in the same direction as in a bowl.

From Herman (2000), Raising is the technique of forming a flat sheet of metal over a cast iron T-stake or head, forming and compressing the metal to take a hollow form, and this labour-intensive process he says is the purest form of silversmithing.

Hurt (2003) described raising as a process where metal is actually compressed around a shape that generally makes it thicker. He continues further that for one to visualize this, one can think of how aluminium foil would wrinkle if formed over an egg. He said the wrinkles in the foil would fold over each other on the sides and be several layers thick but because in raising the wrinkles are not needed, one will need to move the metal, patiently compressing it where it would normally want to wrinkle.

Plate 2.3: Late 15th Century German Knees

By William Hurt

Source: http://www.arador.com/index.html

Hurt believes that, the late 15th century German Knees (part of an armour) were made by the raising technique and the photograph presented in plate 2.3 above is his proof when he tries to reproduce the German knees using the technique.

Thing (2000) also asserts that most of the early age armours were produced by the raising technique. By this method, he has succeeded in reproducing an 11th century armour by hitting a single piece of steel plate many hundreds of times until it looks like a helmet. The finished product of his reproduction is shown in plate 2.4 as a Norman Helmet.

Plate 2.4: A Norman Helmet

By Eric Thing

Source: http://www.arador.com/index.html

With a modern approach to the raising technique, Yotkov (2007) establishes the fact that he uses the technique to produce bowls and other art works which he further finishes off using decorative techniques such as chasing and repoussé. The photograph presented in plate 2.5 is an example of the modern application of the raising technique by Yotkov.

Plate 2.5: Bowl. 4 3/4" x 7 1/2"

Raised copper, chased, patina, bees wax.

By Valentn Yotkov.

Source: http://www.valentinyotkov.com/gallery2.htm

It can be concluded from the opinions expressed by the artists mentioned above, that the raising technique or process is all about transforming a flat piece of metal or tube into any shape by hammering it on a metal or plastic stake, wooden or any supporting former. In spite of all the pleasing qualities presented by the raising technique in the earlier period, Fraser-Lu (1989), argues that because raising is such a time consuming process, many bowls are now shaped by a spinning process which uses a lathe-mounted mould.

2.4 Spinning - Definitions

Wikipedia the free encyclopaedia (2006), defines metal spinning, or spin forming, as a metal working process by which a disc or tube of metal is rotated at high speed and formed into an axially symmetric part using tools. The author explained that, it is a craft that developed when it became possible to keep a lathe revolving in one direction rather than the use of a bow string to drive it in alternate directions. He continues that a flat disc of metal is clamped against a shaped former held in the chuck and while it rotates, a wooden tool is held against it and pressure is applied to gradually form the disc to the shape desired. He concluded that bowls are easily made and vessels with parallel sides are possible within limits.

Herman (2006), describe spinning as a technique that originated in the early 19th century and can be used for most metals. To continue, he stated that a metal disk is set on a lathe behind an appropriately shaped metal or wooden chuck, and during rotation the metal is pressed onto the chuck with long-handled, polished steel tools. He added that, Britannia metal was often spun and a typical, modern spun object is the aluminium saucepan.

Siegner (1961) also believes that metal spinning is the process of converting sheet metal into cylindrical shapes by using a lathe and spinning tools. He adds that, in the spinning operation the metal is shaped by pressing or "spinning" it over wood or metal forms as it is turned by the lathe.

Also from the Robotic Metal Spinning Company (2007), metal spinning is a plasticity forming process that forms a metal sheet or tube by forcing the metal onto a rotating mandrel using a roller or a paddle tool. The company continued that the process is widely used for producing round hollow metal parts and products. e.g. tableware, kitchenware, ornaments, lighting fixtures, parabola antennas, boilers, tanks, gas canisters, nozzles, engine parts, and tire wheel covers. The company also expressed that the forming process is known as a highly-skilled manufacturing craft by artisans and it requires decades of experience.

Queiroz (2003) also established the fact that metal spinning is a technique where a flat metal disk is pressed against a form while turning in a lathe. He stated that it is a convenient method for the making of balls and other round elements for use in high-voltage instruments. He added that the process is not fast and rather difficult to master but hollow balls or items produced by this method are much lighter, and use much less material.

Below, he displays half-balls made in several sizes and materials (aluminium, copper, and brass), as they were obtained from the same spinning process.

Plate 2.6: Half-balls

By Antonio Carlos M. de Queiroz.

Source: http://www.coe.ufrj.br/~acmq/index.html

2.5 The History of Spinning

Though the beginning of metal spinning seems uncertain so far as history is concerned, Franjo (2005) affirmed that the potter's wheels of the ancient Egyptians have been claimed by certain historians to provide the basis for the forming process. According to him, the first evidence of metal spinning techniques being used for the forming of metals were said to have occurred in the Middle Ages. This he thinks is evidenced by an old wood carving, which shows a metal spinner engaged in the production of what should arguably be metal vessels in Plate 2.7.

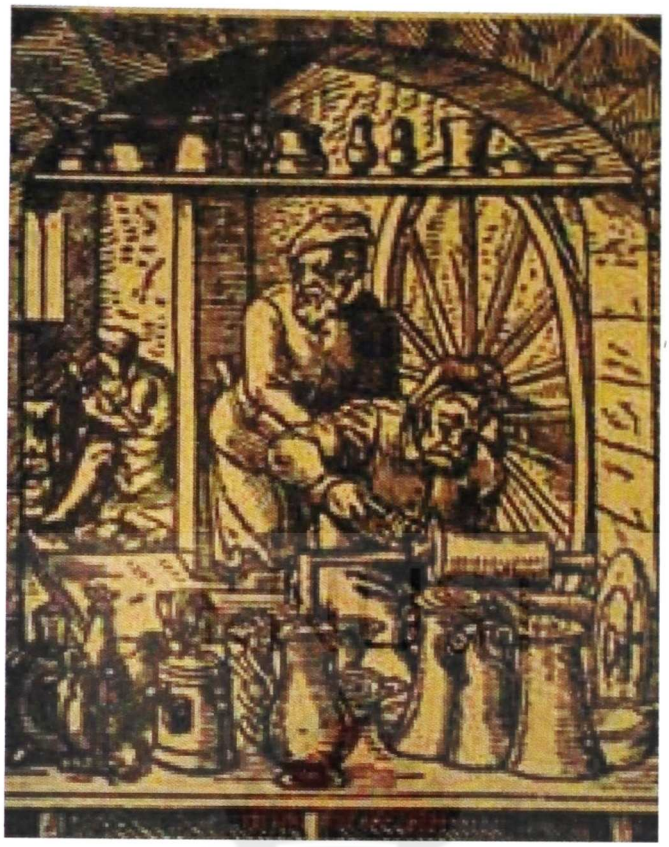


Plate 2.7: An old wood carving depicting metal spinning
Source: http://www.franjometal.com/metal-spinning/intro-metal-spinning.html

Franjo continued by stating that, the motive power for the lathe on which the spinner is forming the vessels is being provided by a second person turning a large wheel connected to the lathe spindle by belt. Considering that even modest hand metal spinning lathes today have electric motor drive ratings in excess of 1.5KW, it is apparent that the technique as illustrated in this plate might have had very severe limitations. Only very thin, soft metals could be formed by the metal spinner with his/her stick-type tools. However, despite the limitations, this method of metal spinning represented a significant

advance on the techniques used until then, which were limited to either casting or hammering.

Later, the metal spinning process advanced as both water power and steam power were used to drive the main spindle of the metal spinning lathe, but the hand spinner was still required to provide both the motive power and the forming skill necessary to transform a flat blank into the finished hollow component.

With the advent of the electric motor, the hand metal spinning lathe reached the ultimate in its development, the limitations being those of the power which could be provided by the hand spinner. The next step then was the development of some form of power assistance for the hand spinner so that he could concentrate solely on the metal spinning technique. The use of feed screws with hand wheels has not been particularly successful due to the high feed rate which the spinner has to achieve, particularly in the transverse movement. The real breakthrough came with the use of the hydraulic power and the change from the stick-type tool to the use of a roller.

This permitted the metal spinning of components in harder metals of heavier gauge and led to the development of the newer techniques of shear forming and flow forming. However, the final result on each component was still dependent on the skill of the individual operator and such factors as varying levels of concentration, fatigue, experience etc. In other words, the human factor still had to be taken into account in the metal spinning process.

The need therefore, was for a method of controlling the machine which could duplicate the actions of a skilled hand spinner in a fully automatic manner. The answer came with the introduction of the multiple swivel template and hydraulic copying system which provided metal spinning machines extreme flexibility. Subsequently, metal spinning machines were developed using the CNC principle, in which the control data is stored in magnetic core data banks. Such machines fitted with turret-mounted tool holders represent the ultimate so far developed in this field.

Plate 2.8: Spun metal products

By Metalcraft Spinning & Stamping Ltd. 2006

Source: http://www.metalcraftspinning.com/image/gall

Metalcraft Spinning & Stamping Ltd. 2006, the photograph in plate 2.8, shows some basic shapes that can be produced by the spinning technique.

From the review, one can conclude that spinning, is a process by which a disc or tube of metal is clamped in a lathe and rotated at high speed and formed into an axially symmetric part using specialized tools. However the process has some limitations. Ventura (2006) points out that for a complicated shape or design to be produced, the design will have to be made in different components which will mean that each component will have to be spun separately. The parts will then have to be soldered together to obtain the final design or object.

CHAPTER THREE

RESEARCH METHODOLOGY

The previous chapter reviews literature related to the topic. This chapter deals with the research design which comprises the descriptive research method, experimental research method and data collecting instruments used in the project.

3.0 Research Design

The researcher used the experimental and descriptive research methods as the main methods for the research. These methods were based on the qualitative research approach.

According to Webster (1985), to research is to search or investigate exhaustively. It is a careful or diligent search, studious inquiry or examination especially investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts or practical application of such new or revised theories or laws. It can also be the collection of information about a particular subject.

With this in mind the researcher sought to experiment on the raising and spinning techniques of metal forming to find out how well the two techniques can be combined to aid in the forming of artistic hollow ware. The techniques were experimented with and the results or the findings were expressed in descriptive data.

3.1 Qualitative Research Approach

Best (1981) opines that the qualitative research study is the type in which the description of observations is not ordinarily expressed in quantitative terms and this does not however mean that numerical measures are never used in qualitative research, but that it is not largely dependent on numbers.

This implies that the qualitative research approach is usually based on quality rather than quantity as adopted in this project. The researcher used this approach because the work target is not about quantity but rather the quality of work that the combination of the two techniques can give.

3.2 Experimental research method

Experimental research is a systematic attempt to investigate the favourable cause and effect relationship between two or more variables that are classified as independent and dependent variables. Best (1981) explains that

experimental research describes what will be when certain variables are carefully controlled or manipulated. Experimental research manipulates one or more independent variables in a controlled setting. It focuses on relationships between variables and draws conclusions.

The basic idea of experimental research, according to Leedy (1981), is the attempt to account for the influence of a factor or, as in the case of complex designs, of multiple factors conditioning a given situation. In simple terms, it attempts to control the research situation.

The experimental research method was used to assess the suitability of available tools, materials and equipment used in the project. Experiments were conducted to find out how well the spinning and raising techniques can combine to form hollow ware with suitable metal.

3.3 Descriptive Method of Research

The descriptive research method, according to Leedy (1981), deals with a situation that demands the technique of observation as the principal means of collecting the data. The population for the research must be carefully chosen and clearly defined. Data in descriptive research are particularly susceptible to distortion through introduction of bias into the research design. Although descriptive research relies upon observation for the acquisition of data, the data must be organised and presented systematically so that valid and accurate

conclusions can be drawn. It is a type of research that simply looks with intense accuracy at the phenomena of the moment and describes precisely what the researcher sees.

The descriptive research method was used in the study to review related literature and to describe the various techniques and processes used in the project. It was also used to describe the design and production processes, as well as findings and results of the study.

3.4 Data Collection Instruments

The research tools used were interviews and observation. Some local craftsmen and resource persons who are knowledgeable in the field were interviewed at their workshops and offices. Interviews were personally conducted with some local craftsmen and lecturers of the Metal Product Design Section of the College of Art and Social Sciences, KNUST. Some students were also selected randomly and interviewed.

Some of the resource centres the researcher visited during the study includes the KNUST main library, College of Art Library, British Council Library Kumasi and the personal libraries of Mr K. A. Asomaning and Mr E.Y. Ansah both lecturers at the Metal Product Design Section of the College of Art and Social Sciences, KNUST. The following were the main sources of information: text books, journals, a few theses and project reports submitted by students of KNUST and also the World Wide Web.

The main workshop and studio used during the study are the Metal Product Design Section work shops and studio.

After gathering the relevant information, and taking into consideration the inputs made by the various resource persons, a number of experiments were conducted. These experiments started with the raising technique and careful note was taken on how long it took to finish a simple work. Also recorded were the modifications made to the original design in the course of using this technique to complete a simple object. The same experimentation was carried out on the spinning technique to find out its effects on design and the time frame involved in finishing a piece of work. After experimenting with the two techniques, they were then combined in a simple work to find out how well these two techniques could be combined to produce a piece of work and how long it will take to finish the object.

Selection of materials for production of the designed objects was based on availability of materials, cost of materials, time frame for completion of the project, tools and equipment available and personal work experience with available tools and equipment.

After selecting, identifying and gathering suitable materials for production of the objects, studio work experimentation was began and completed in the Metal Product Design studio of the College of Art, KNUST.

CHAPTER FOUR

DESIGN AND PRODUCTION OF HOLLOW WARE

4.0 Introduction

This chapter deals with the procedures used to accomplish the set goals in the project, explore the raising and spinning techniques and then come out with a combination of the two techniques in hollow-ware forming. The researcher deems it prudent not to talk about tools, materials and their applications in isolation since he will be mentioning them in the processes.

The chapter has been divided into the following sections.

- Exploring the Spinning Process
- Exploring the Raising Process
- Combining Raising and Spinning
- Production of final objects using Raising and Spinning.

4.1 Exploring the Spinning Process

This part of the chapter describes how the wooden mould was prepared before spinning took place.

Plate 4.1: Turning the wood on the lathe

Plate 4.1(ABCD) shows a pictorial description of the wood mould preparation from the round block through trimming to the beginning of shaping. It shows the wood as cut by band saw (A) mounted on the headstock of the lathe (B). Trimming was then

done (C and D) to get the diameter closer to that of the finished wood mould before the final shaping.

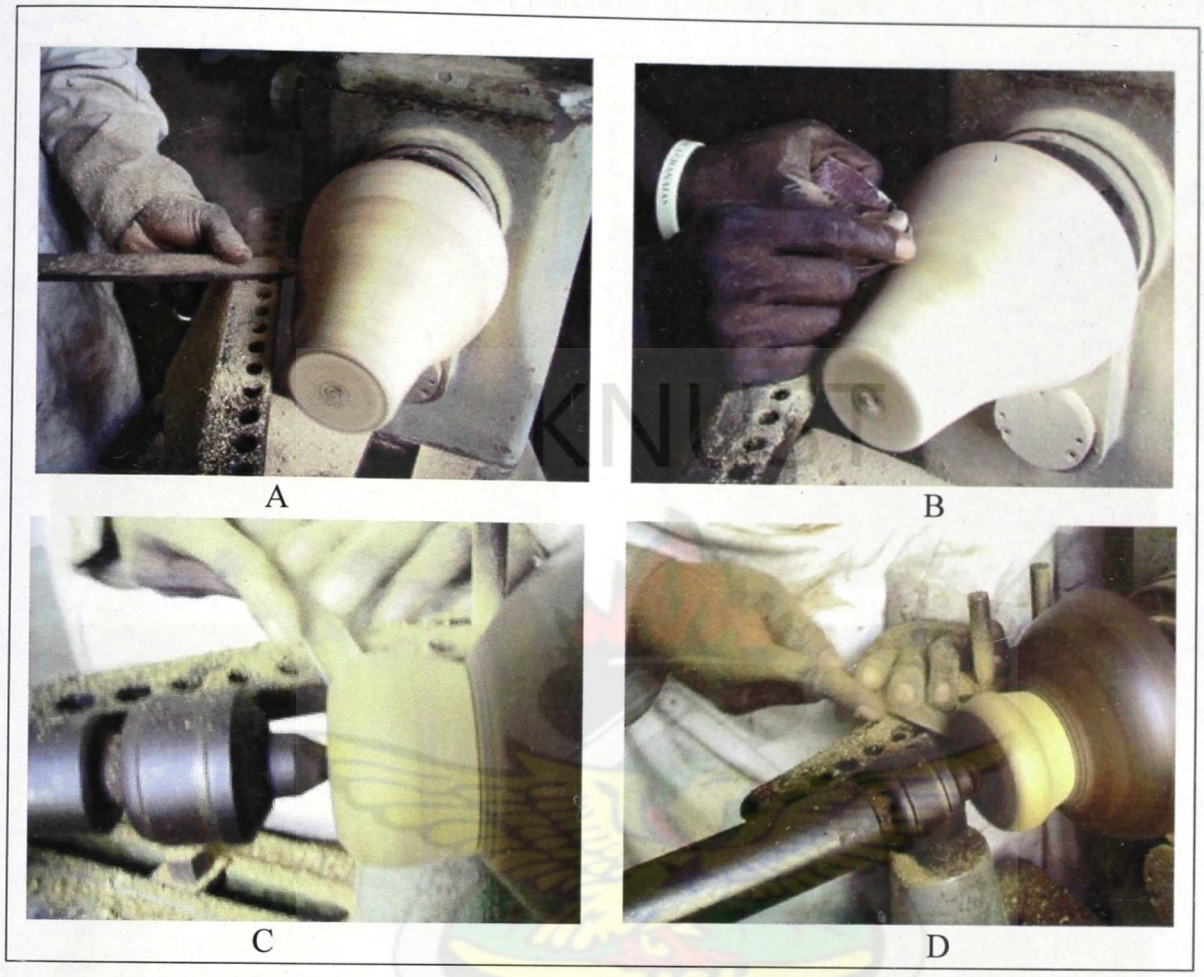


Plate 4.2: Finishing the wood turning

Plate 4.2 shows the shaping process and the smoothening (finishing) of the wood mould using the sand paper. In C and D, the wood backing that will hold the metal sheet in position against the wood mould during spinning is being prepared.

4.2 The Spinning Process

This part of the chapter also gives a pictorial illustration of the spinning process. It shows a step by step process of how the entire spinning is done.

Plate 4.3: Starting the spinning

In plate 4.3 above, a blank copper sheet or sheet is prepared, annealed and then placed between the wood mould and the wood backing on the lathe. The blank is then carefully centred so that it does not wobble during the spinning process. Spinning then commences by using a special metal spinning tool to push the copper plate against the wood mould.

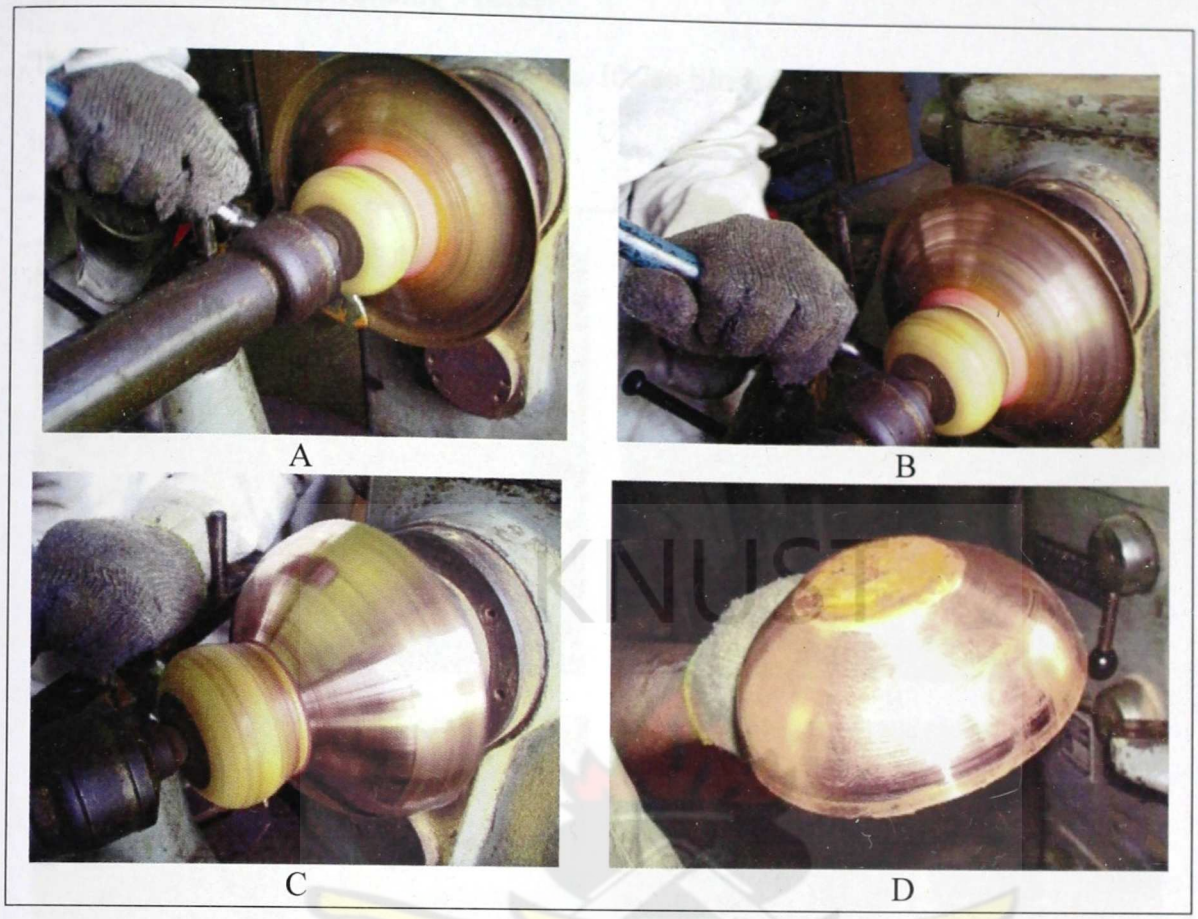


Plate 4.4: Spinning continues

Plate 4.4 shows a continuation of the spinning process in which the metal tool is moved in a back and forward motion several times until the copper blank finally touches the perimeter of the wood mould thereby taking its shape. The final result is a hollow metal piece with the same shape as the wooden mould.

4.3 Exploring the Raising Process

This section describes the raising process. It also illustrates the general steps entailed in the raising process.

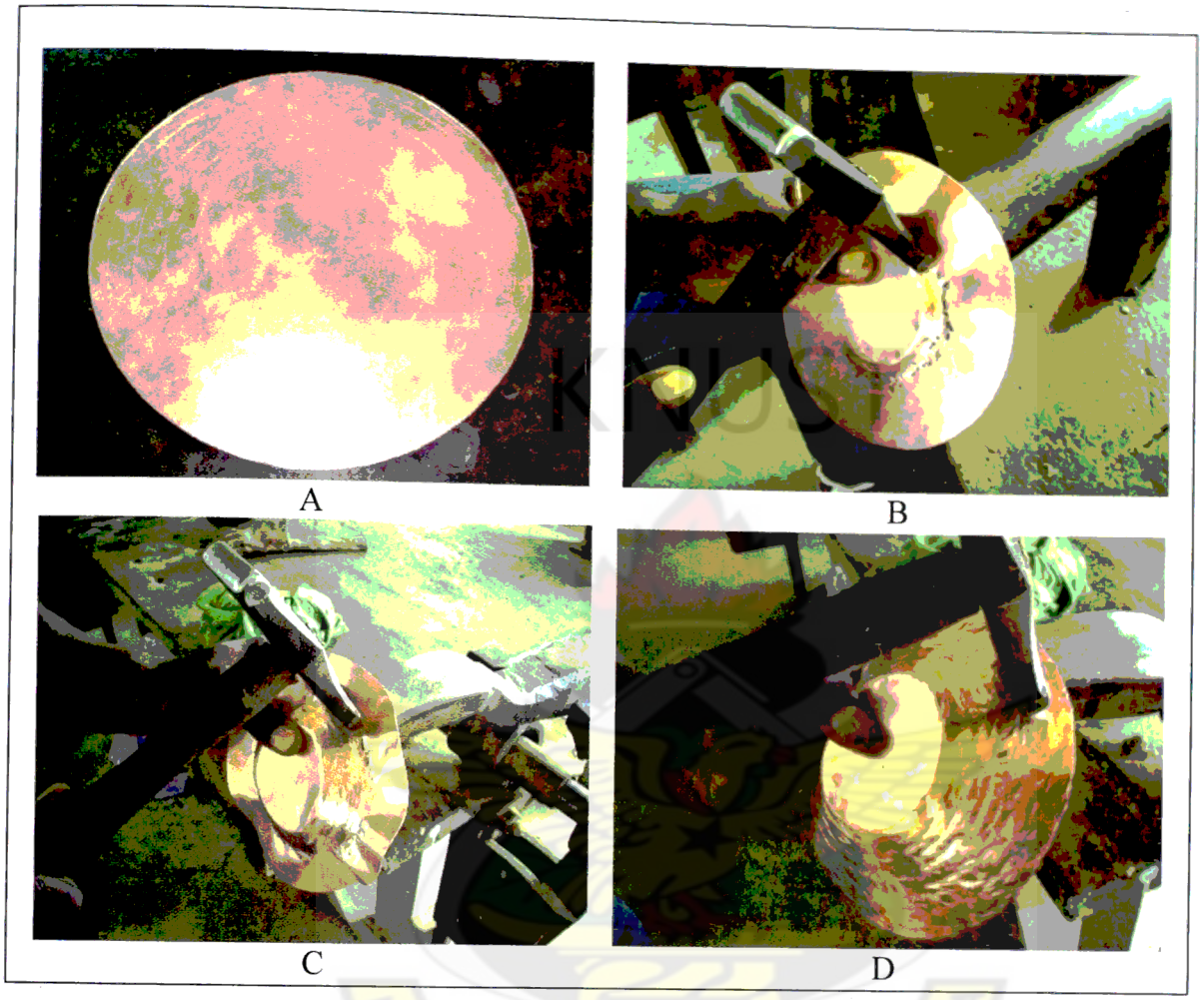


Plate 4.5: Stages of the raising raising process

In plate 4.5 above, a copper circular copper sheet is cut and concentric circles marked on it using a pair of dividers. In raising a bowl or any round symmetrical object, one has to hammer in straight circles hence the marking of the concentric circles as a guide. "Raising" then begun by holding the copper sheet against an appropriate metal stake, and hammering on the concentric circles using a raising hammer. Once a circle

is completed, another is started and this, forces the sheet metal against the raising stake until a conical bowl-like shape is obtained.

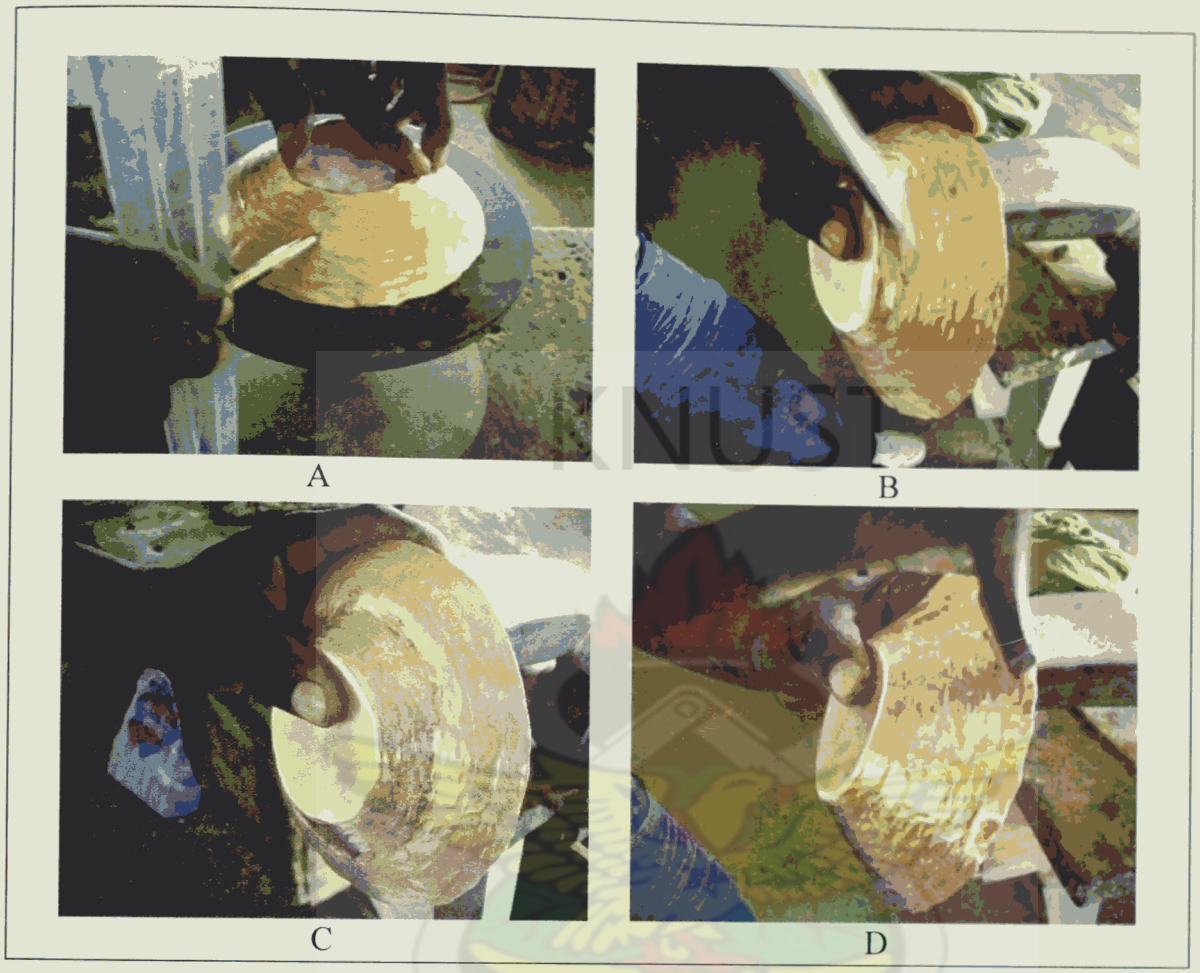


Plate 4.6: Raising continues

In plate 4.6, the piece after the first raising, was annealed, cleaned by pickling and brushed; the concentric circles are remarked using a turn table. This helps to keep hammering in the right circles in order not to deform the shape of the bowl. In this type of "Raising", hammering is done from the bottom to the edge of the bowl depending on the shape.

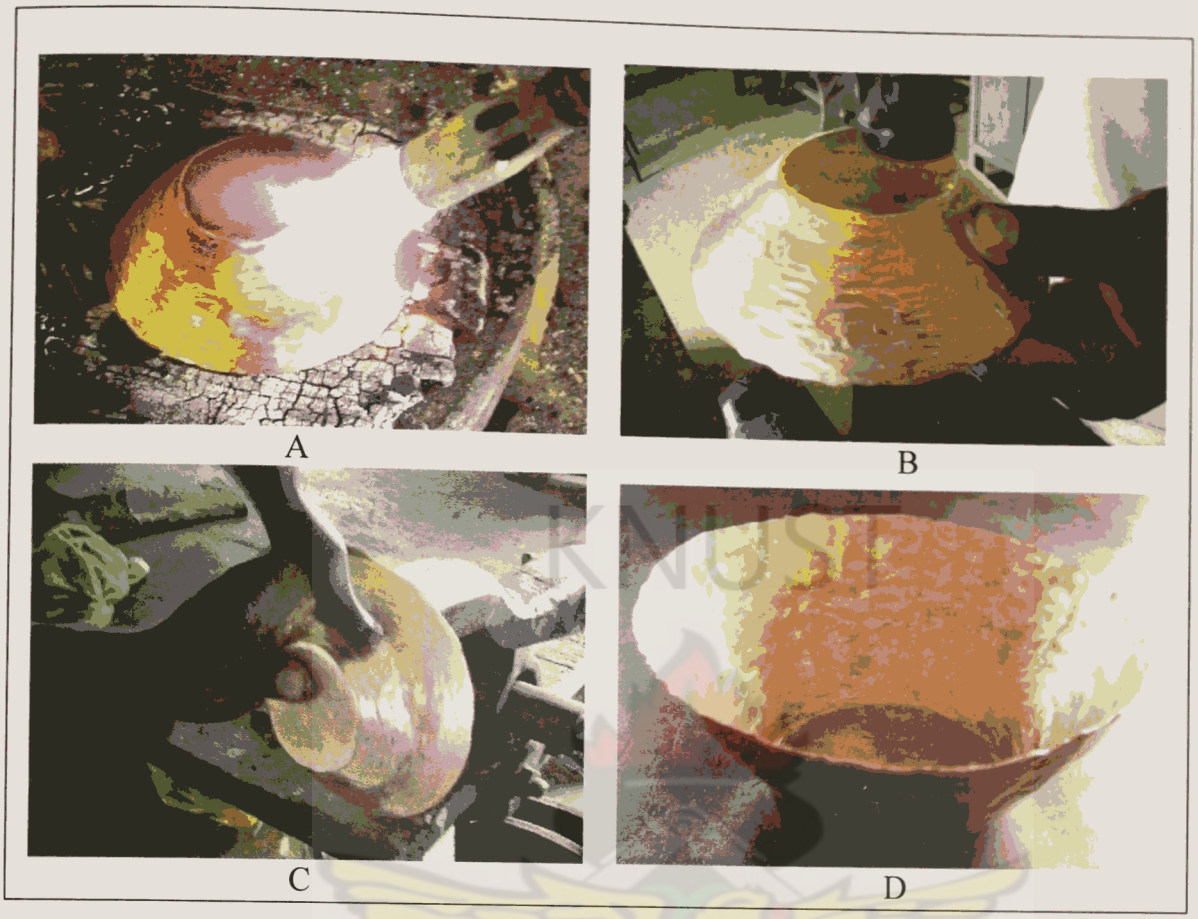


Plate 4.7: Raising continues

After getting the desired shape, the piece is annealed and cleaned again and the flat bottom of the bowl is straightened on a flat stake using a planishing hammer. The raising process was repeated several times until the desired form was obtained.

Plate 4.8: Finishing the raising

Once the desired shape has been obtained, the work has to be smoothened in a process called planishing. Smoothening was accomplished by bringing the work to the stake and the wall planished against the stake. This process was also done in concentric circles to prevent distortion of the shape.

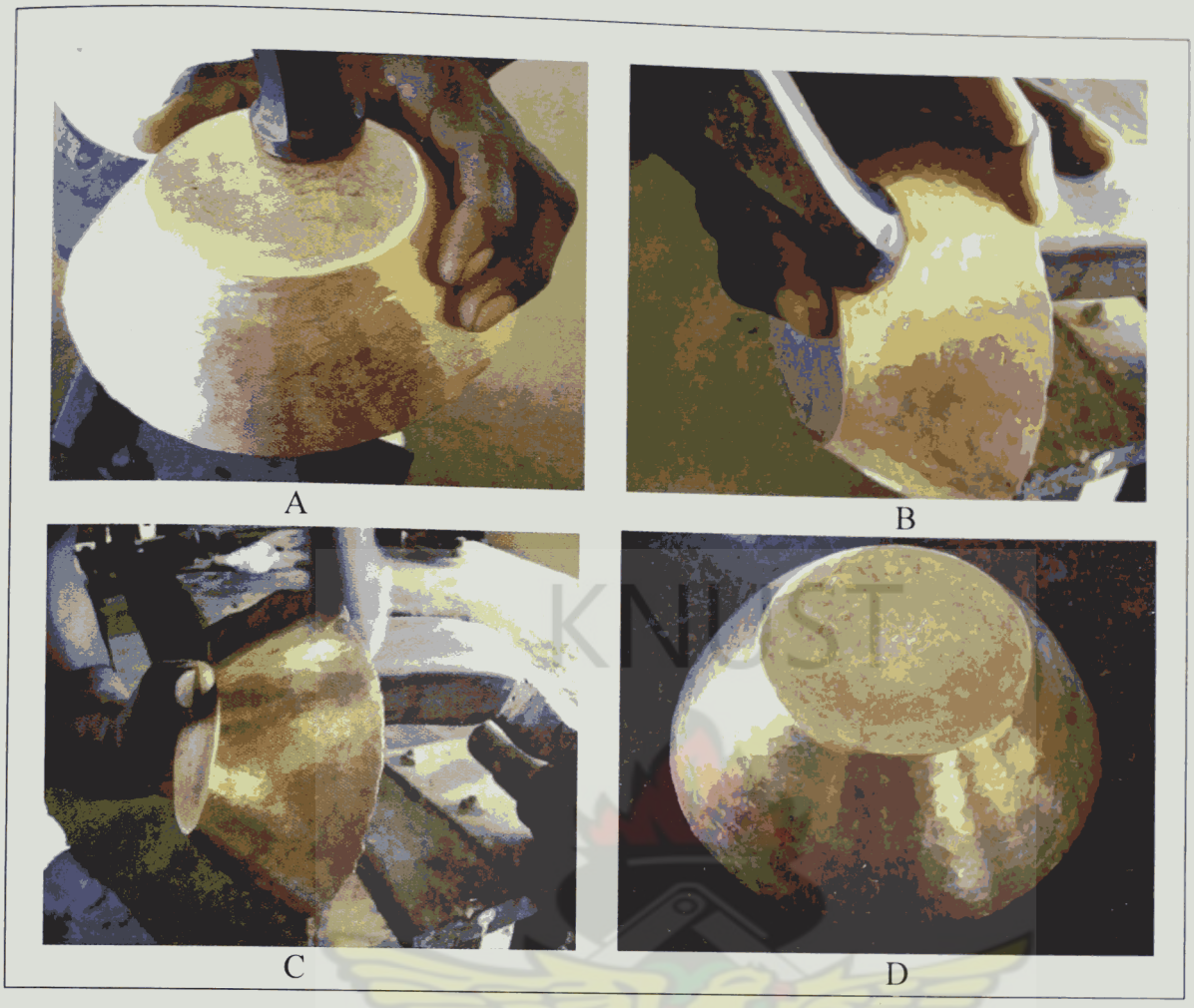


Plate 4.9: Finishing the raising

The planishing process was repeated several times by controlling the hammer blows in subsequent rounds until the desired surface finish was reached.

Plate 4.10: Preparing and soldering of parts for the coffee pot

Because the researcher's target was to form a coffee pot out of the raising exercise, a second piece was raised to close the bowl. This also went through the same raising process step by step until the right shape and form which fitted the first bowl was arrived at. An opening was then pierced into the bottom of the second raised piece and then marked and soldered together. Other parts like the spout and the handles were also fabricated and soldered to get the complete coffee pot.

Plate 4.11: Coffee Pot, Dimension: 230mm high x 265mm wide, 2008

Plate 4.11 is the completed coffee pot executed by "raising" the various parts separately and then joining them together by soldering.

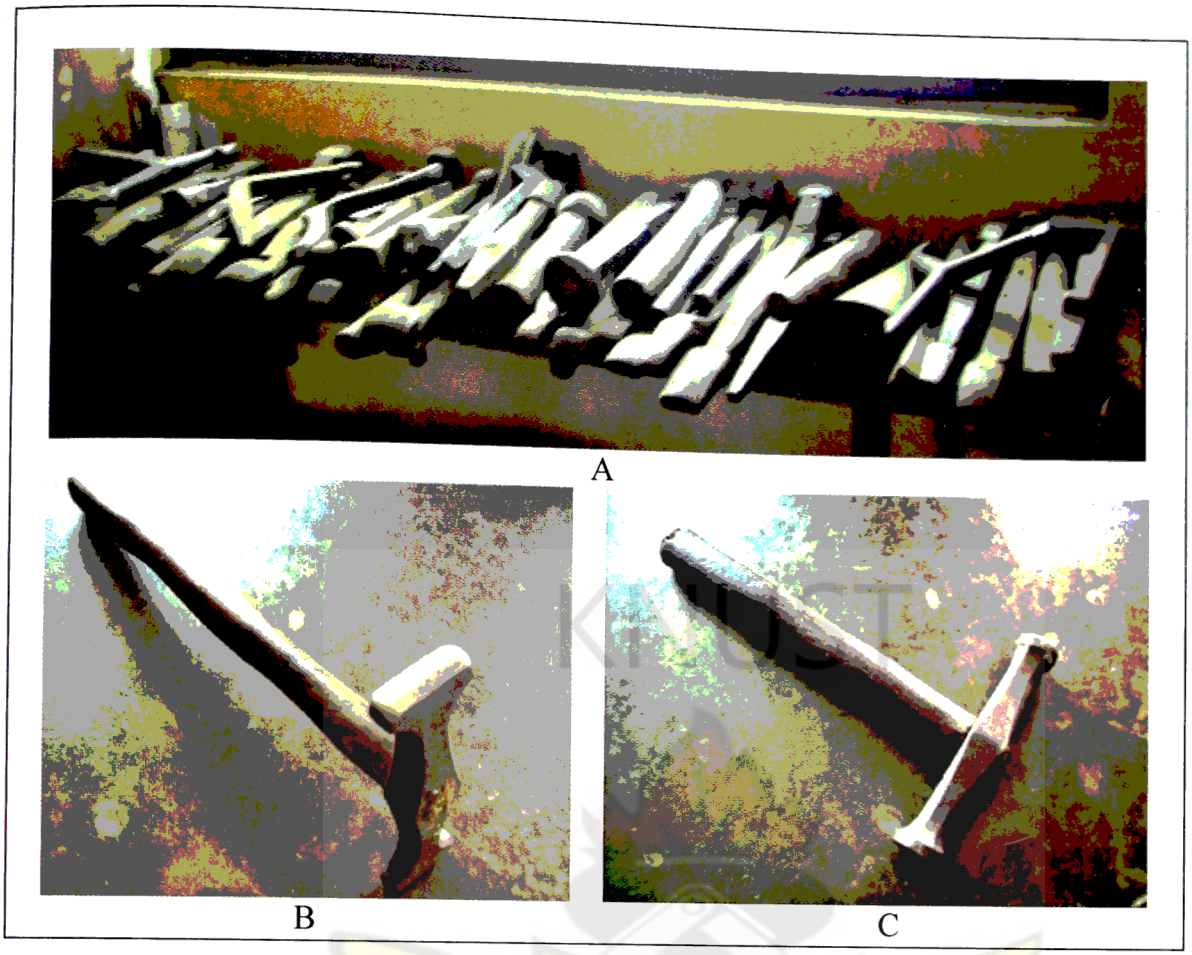


Plate 4.12 Stakes and hammers

The upper part of plate 12 shows a picture of the variety of raising stakes from which the researcher has to select from, for the raising exercise. The lower left shows the picture of a raising hammer which was used for raising and the lower right shows the picture of a planishing hammer that was used during the planishing process.

4.4 Combining "Raising" and "Spinning"

This section is the result of an effort made to experiment with two metals namely aluminium and copper to find out how well these two metals work with the two techniques (raising and spinning). The researcher decided to use aluminium and copper because these are metals that are very convenient for studio "spinning". Therefore the researcher tried to find out how well these two metals can accept the "raising" process as well.

Plate 4.13: Experimenting with aluminium

In the plate shown above, the researcher was able to spin aluminium and then continued to find out how well it conformed to the raising technique. After several efforts to close the aluminium by raising the metal would just not respond. Instead of

the metal compressing as is usually the case in "raising", it rather ended up stretching. Hence the conclusion that it was not ideal for the project.

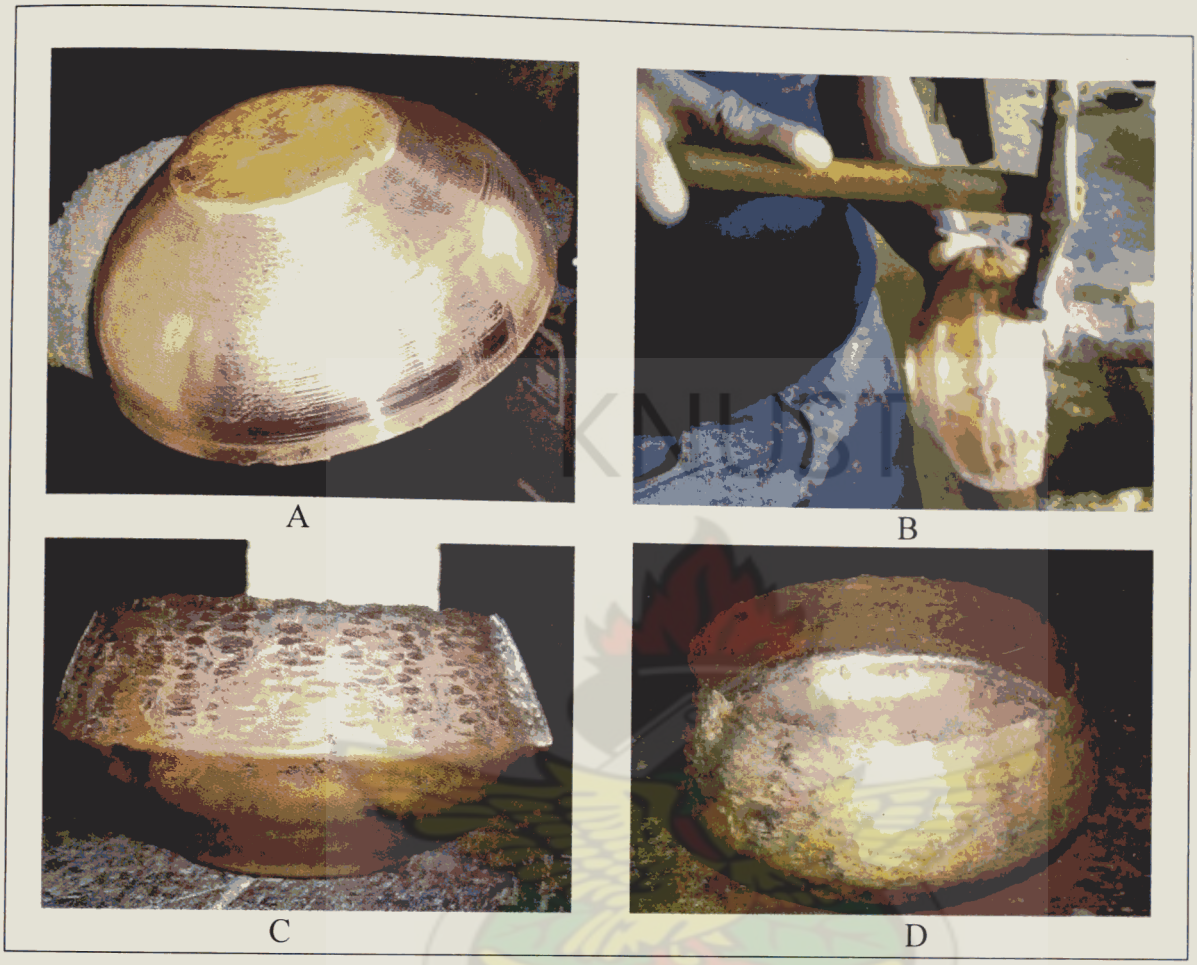


Plate 4.14: Experimenting with copper

Plate 4.14 above displays pictures of copper being worked after it has been spun. Copper unlike aluminium responded well to the raising process by being compressed appropriately as should be the case in raising. The metal when being hammered compresses well, allowing shaping and forming to take place easily hence aiding the "spinning"-"raising" combination. This experiment brought the researcher to the conclusion that copper will be the best metal available to use for the project.

Plate 4.15: Bowl produced by spinning and raising, Dimension: 230mm high x 265mm wide (2008)

4.5 Production of Final Objects using Raising and Spinning

4.5.1 Design Development

Designs for the project were not done in a vacuum but were based on certain factors, since the principal task in this project was to be able to combine 'raising' and 'spinning' to form hollow ware or vessels. Having this in mind, the forming of each of the pieces to accept the two techniques became a deliberate attempt. The designs were developed based on knowledge acquired during experimentation with the two techniques in s studio setting. Another crucial factor that shaped the researchers idea development was the availability of materials, tools and equipment, not forgetting the stipulated time-frame within which the project was to be completed.

The researcher also developed designs taking into consideration the number of pieces that will have to be joined or soldered together to form a final piece. In other words the researcher given a particular design had to figure out the number of separate parts required to arrive at that particular design.

Again, designs for the project were not based on functionality, technical properties or qualities alone but also on concepts like fusion, (oneness, mingling, mixing, adding, soldering, welding binding and union).

After going through a series of sketching and drawing exercises, the following designs were selected and refined for the final stage of this project.

4.5.2 Design 1

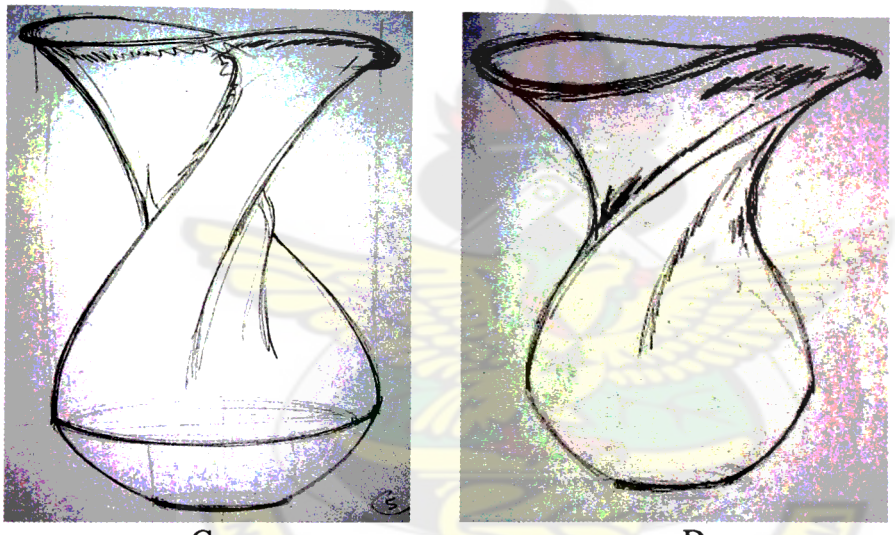


Figure 4.1: Design 1

In the figure 4.1 above, the researcher developed designs based on the idea that he wants to use a one piece plate to form the entire work or piece. This idea guided the researcher through the design process. After a series of considerations, the researcher selected "D" in plate 4.16 for the one metal piece project.

4.5.3 Design 2

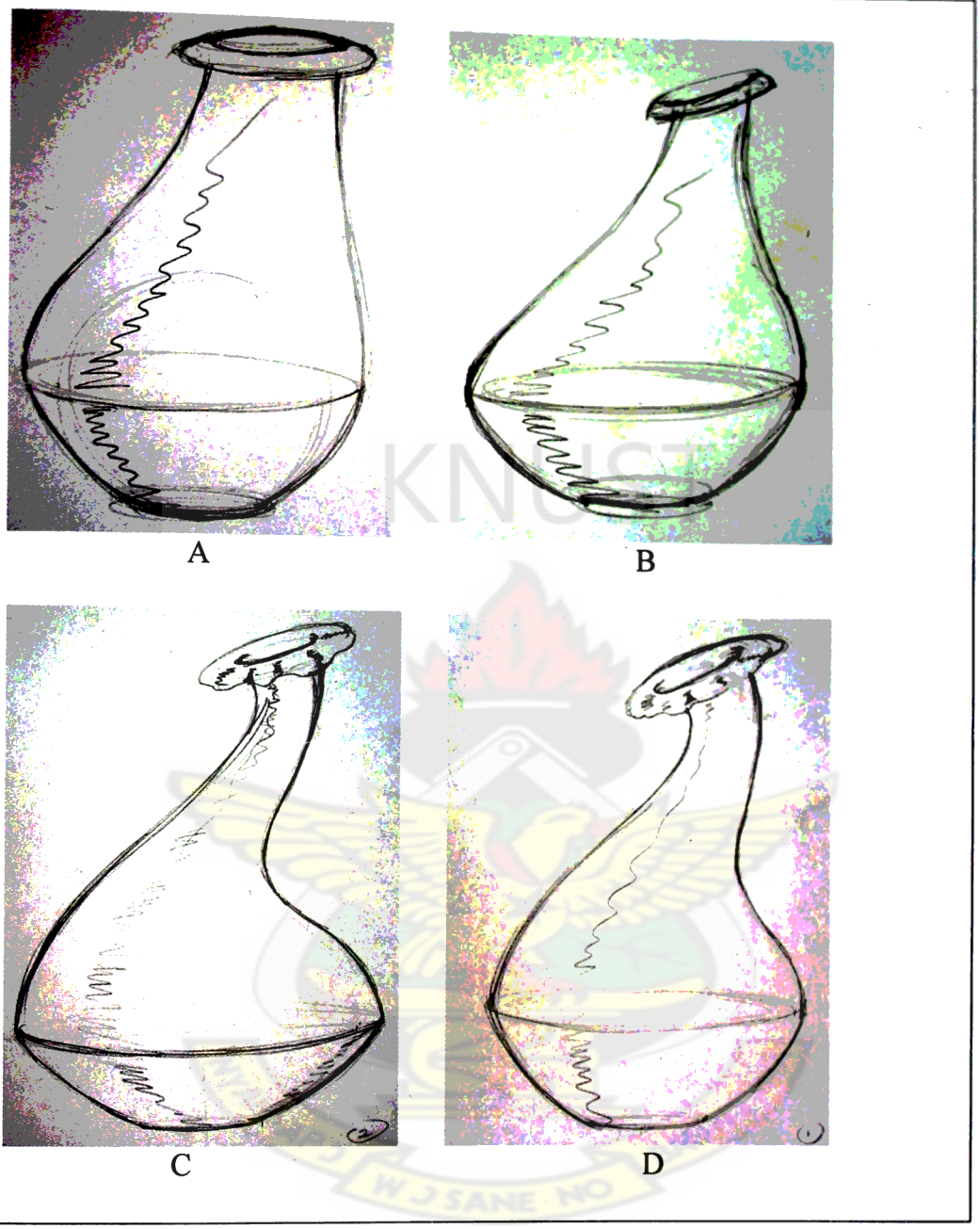


Figure 4.2: Design 2

This figure shows designs based on two part fabrication. The researcher evaluated the designs based on how the two pieces would be fabricated, tools and equipment available. This evaluation process finally led to the selection of design "D" in plate 4.17 as the final design for project 2.

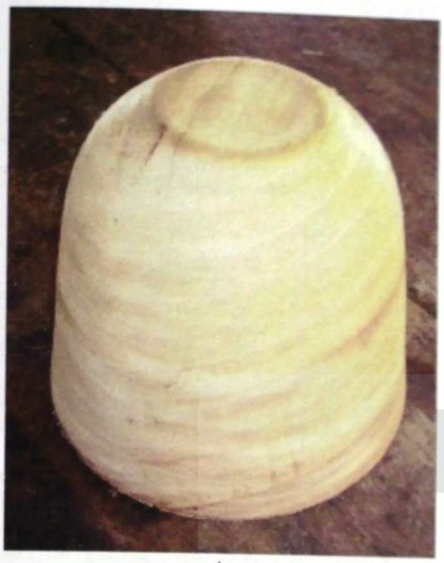
4.5.4 Design 3

Figure 4.3: Design 3

For project 3, the researcher decided to increase the number of part fabrication to three, hence the designs were developed accordingly. After evaluating the designs based on the ideas listed in the design development process, the researcher picked design "D" in plate 4.18 to be the best design for project 3.

4.6 Fabrication of Projects Based on Spinning and Raising Techniques.

4.6.1 Project 1



A

B

C

D

Plate 4.16: Spinning for project 1

Project 1 is the execution of design 1. After analyzing the design, an appropriate wooden mould was prepared as required for spinning. Spinning then commenced through the various stages to complete the first stage of project one as shown in plate 4.16 D.

A

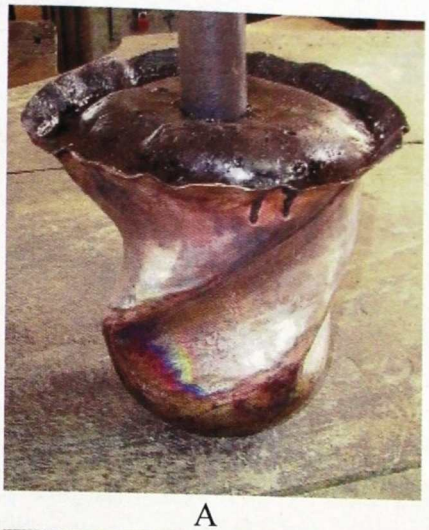
B

C

D

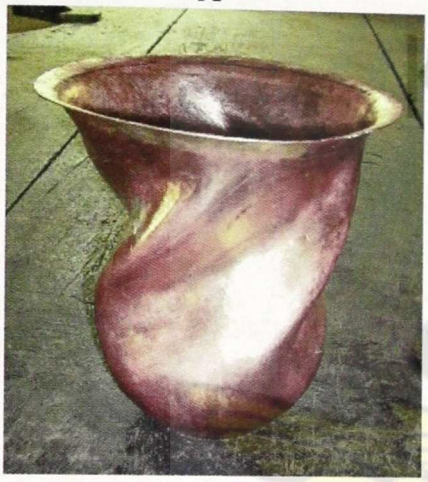
Plate 4.17: Project 1 continues

After spinning, the spun copper was annealed and marked for raising. The spun copper was then filled with pitch because of the nature of the design to commence shaping. Shaping started by using the raising hammer to hammer along specific areas to create the required shape.

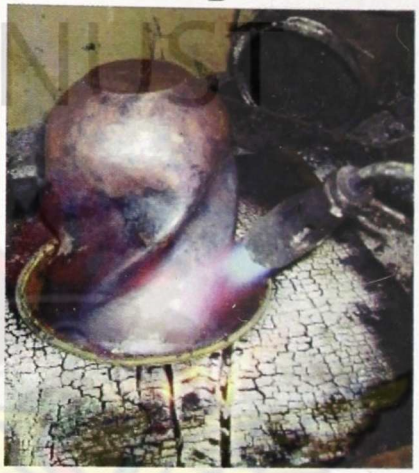


A

B



C



D

Plate 4.18: Finishing project 1

After hammering, annealing and re-hammering several times, the shape was finally arrived at. When the desired shape was achieved the work was annealed again and then refilled with pitch. Planishing was then done to give a smooth surface to the work. This was also repeated several times until the desired surface finish was achieved. Bands were then formed with a brass round rod and soldered onto the base to create a seat and on the top for strength and to create the illusion of a rolled edge respectively to the work. The work after forming was annealed, pickled and cleaned by scratch brushing and made ready for final finishing and polishing.

Plate 4.19: Project 1 completed

4.6.2 Project 2

Plate 4.20: Starting project 2

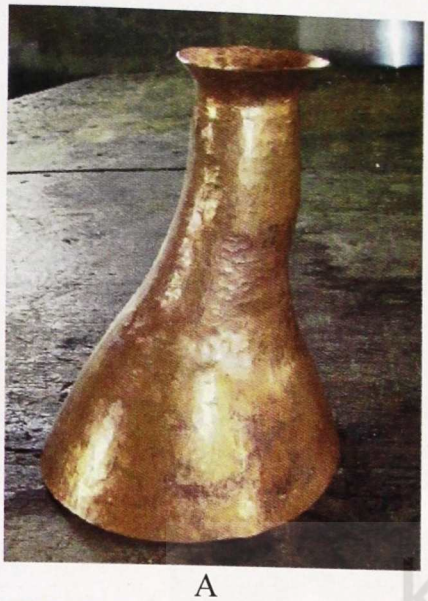
Design 2 was executed for project 2. After analyzing the design, the appropriate wood mould was made. In this project two wooden moulds were made because the design is in two parts, one for the upper part and the other for the bottom. Once spinning was completed (plate 4.20: B), raising technique was deployed for moulding the metal into the required shape and form.

Plate 4.21: Shaping by raising

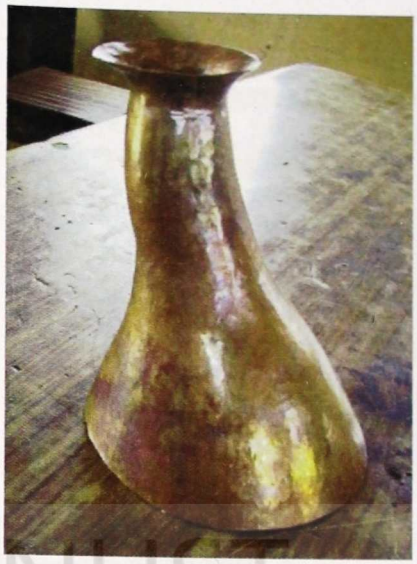
After raising the work to a certain stage, the base was cut open to allow for further raising of the resulting conical tube. This was done so that the neck-like part of the work could be worked on as the top also needed to be opened up a little. These processes are shown in plate 4.21.

Plate 4.22: Planishing

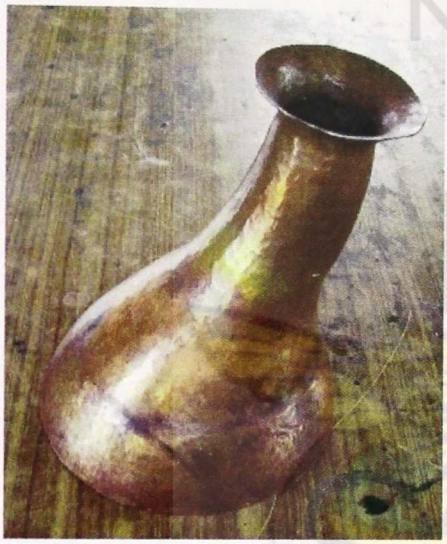
The process continued by shaping the neck and creating the bend at the top. All these processes were done with the raising" hammer over a selected stake. After the expected shape was obtained, the work was annealed, cleaned and then planished over appropriate stake.



A



B



C

D

Plate 4.23: Planishing continues

The planishing process was repeated several times with intermittent annealing, pickling and scratch brushing. The process was carefully executed so that it would be possible to fit the upper part onto the lower part. After several processes of planishing, the upper part was finally made to fit onto the lower part as shown in plate 4.23: D.

A

B

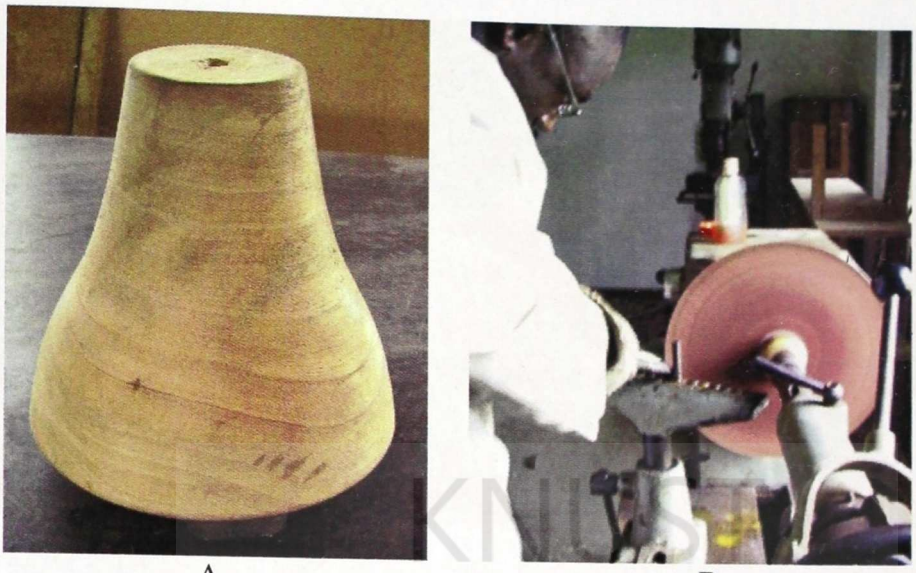
C

Plate 4.24: Final stages of project 2

The neck was further planished to the desired shape and the top moulded. The work was completed by soldering the upper part to the lower part. Plate 4.24 shows pictures of the neck receiving further planishing, the opening at the top also being shaped and finally the soldering process (plate 4.24C).

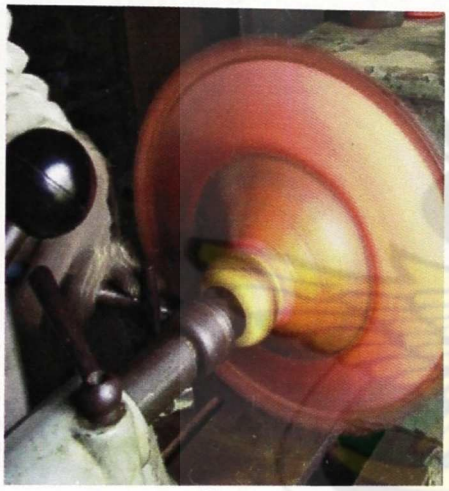
Plate 4.25: Project 2 after fabrication

4.6.3 Project 3



A

B



C

D

Plate 4.26: Spinning for project 3

In project 3, the same wooden mould used in project 2 was employed; this is one advantage of "spinning". The process allows for the use of a single mould to produce several pieces. The mould was fitted on the headstock of the lathe, metal annealed and the spinning was carried out as illustrated in plate 4.26. Project 3 is an execution of design 3 which was a three piece object.

Plate 4.27: Continuing project 3 with raising

After the spinning was completed, the metal was annealed, marked as in project 1 and then raised using the raising hammer. This project was raised using pitch at one time and the raising stakes at other times.

Plate 4.28: Preparing parts for soldering

After completing the upper part of the work by the spinning and raising processes, the base was cut open. The lower part of the work was made possible by spinning two half domes with a flat base for each. This again was done using the wooden mould used for the lower part of project 2. An opening was made into one of the bowls to correspond to the round side of the raised upper part. The two bowls were then bound together with binding wire and made ready for soldering.

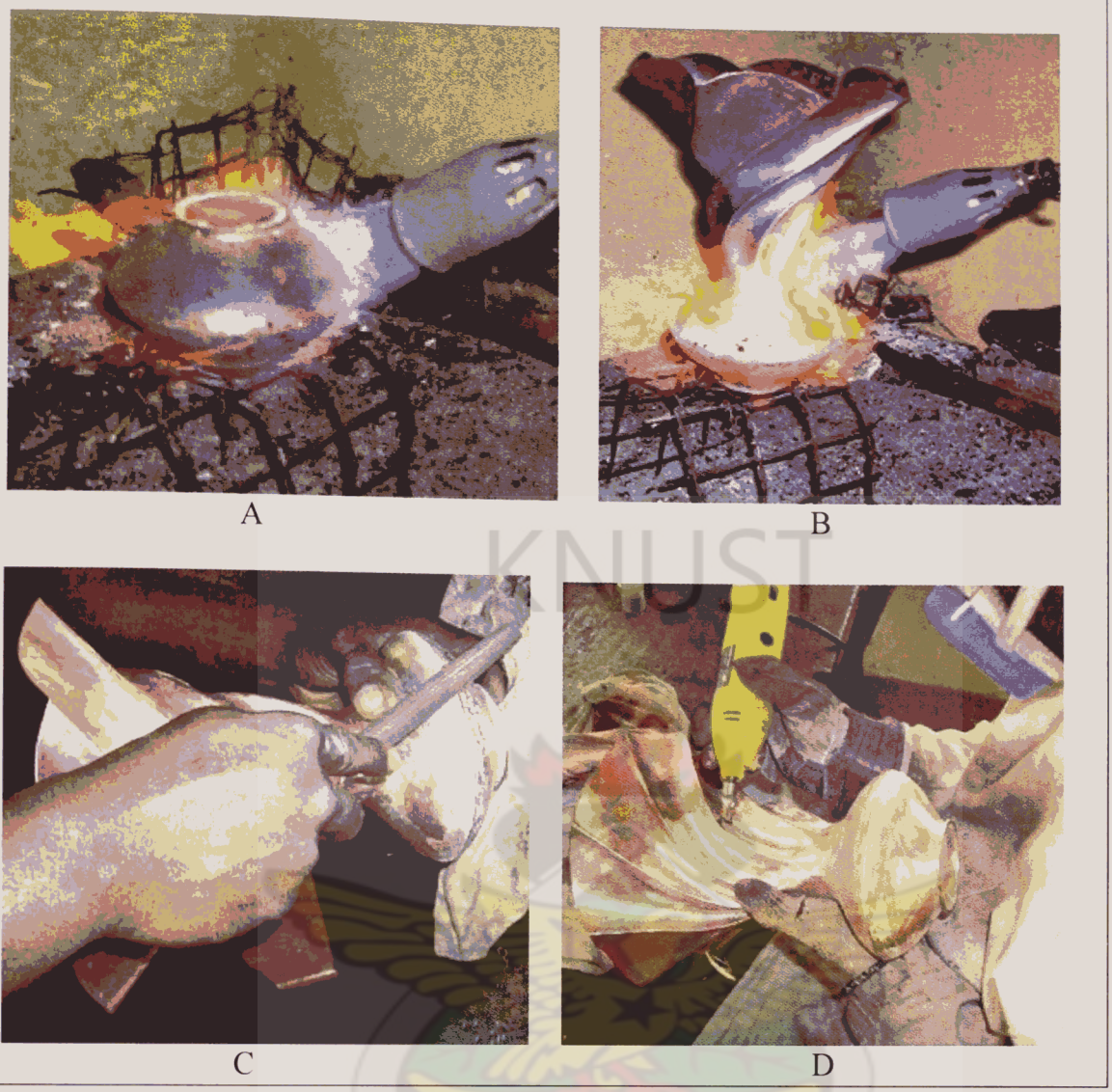


Plate 4.29: Soldering and finishing project 3

Project 3 was completed by soldering the two bowls together and soldering the upper section onto the conjoined domes. The work was then pickled and cleaned. The piece was filed, sanded and then polished to complete the project.

Plate 4.30: Project 3 completed

CHAPTER FIVE

DISCUSSION OF RESULLTS

The previous chapter outlined the general procedures used in executing the objects in this project. This chapter formally and conceptually discusses the results by appreciating, analysing and interpreting them. It discusses the objects under particular working properties and concepts. The major findings of the study have also been dealt with in this chapter.

5.0 Main Findings

5.1 The Time Factor

The researcher observed that with regards to time factor the combination of the raising and spinning process is beneficial as it saves time compared to the use of the 'raising' process alone for a particular design. In the case of project 3 plate 4.33, if the researcher were to use the raising technique for the whole project that would mean that extra work would have to be done by raising the cone shape that was produced by spinning. This would also mean that the walls of the cone will be quite thick which will eventually result in prolonged time of adding the twist to the cone because the thicker the metal, the more difficult it is to shape. Also, the two bowls that were spun to form the lower part of the design, would have had to be raised separately which obviously would have taken days to bring to a smooth finish. In view of the above, it

is worth mentioning that success in hollow ware forming, so long as the technique of raising and spinning is combined, is efficient when time factor is considered.

5.2 The Design factor

Looking at the type of designs the combination of "raising" and "spinning" has produced, one may ask, "Is it not possible to use any of these two techniques to produce any one of the designs in the project?" The answer is yes and no. To comment on the no, spinning is a process used to produce a symmetrical and usually smooth tapered shape. This property of the technique prevents one from producing any of the project pieces using the spinning technique alone. On the other hand, the answer could be in the affirmative because the raising process will be able to produce any of the project pieces. If one should consider though, the amount of time that was required to produce, for instance, design 3 in project 3, one will decide not to use the raising technique alone for the object; a combination of the two techniques would be used. This means that, in the case of any design limitation for the spinning technique, the combination of the "spinning" and "raising" techniques removed that barrier. One can therefore say without a doubt that, a combination of the "raising" and "spinning" techniques knows no barrier as far as designs for decorative and functional hollow wares are concerned.

5.3 Other Factors

Spinning is a relatively simple process. The process allows the material to behave in a fluid and smooth manner. The process does not seem to be labour intensive once the technique has been mastered and experience gained. The process of Spinning results in fine concentric lines or a smooth finish on the surface of the work, depending on the type of spinning tool used. Contrary to this, raising is quite a tedious process and is labour intensive. The hammering process involved in the raising technique also triggers the idea of pain. The hammering process also gives some form of dotted effect on the surface of the work which in a way represents the "pain" that the work has undergone. Infact the whole process seems to exude a feeling of pain.

Consequently, due to the labour intensive nature of the raising technique, as opposed to spinning, the researcher was compelled, in making a fair analysis, to consider a fusion or rather a combination of the two techniques. In this regard, the researcher becomes the officiating minister who solemnises the union between two opposites; "pain and love" and the fruit of this matrimony is "passion for gourd" which became the theme for this project.

5.4 Appreciation and Interpretation of Results

5.4.1 Project 2 "Gourdly Passion"

"Gourdly Passion" has the basic shape of the natural gourd. It is an art piece made of copper by the combination of raising and spinning techniques. The piece measures 220mm in height and 142mm in diameter. The piece was made in two parts and soldered together. The upper part has some form of dotted effect as a result of the technique used to finish that part while the lower part has been finished smooth through the spinning process. This creates some form of contrast between the two techniques used in the production of the object as the textured and the smooth surfaces set the boundaries for the techniques used.

The work when seen from the front looks symmetrical but from the side looks unbalanced. This is a deliberate act that displays the stylistic purity and the strive towards perfection of skill of the artist. The imbalance also buttresses the fact that, spinning is used for creating symmetrical objects, but with a combination of the two techniques, one can create almost anything.

5.4.1.1 Interpretation of Result

"Gourdly Passion" is a metal object made from copper. It was fabricated in two parts, by the spinning and raising techniques and then joined together by soldering. "Gourdly Passion" is a play on the word "Gourd/God" through resemblance and was made in two pieces; a lower part and an upper part. One begins to wonder what affiliation the word "God/Gourd" has to do with the number two. We live in a world where everything seems to have its opposite. Good and bad, pain and pleasure, male

and female, night and day, rough and smooth, etc. In Ghanaian traditional religion, God is believed to be one and whole. It begins to sound contradictory therefore when the bible makes mention of making 'man' in his own image, knowing that he made man and woman. The question of which of the two is his real image, is laid to rest when the religious minister announces that "the two shall become one". Interestingly enough this pronouncement is not made until the metal artist completes his/her task of fabricating a precious metal. It is in this vein that the piece "Gourd/God" gets its name; the oneness of the "Gourd/God" comes in the soldering of the lower and upper parts together. The roughness of the upper part as compared to the smoothness of the lower part in the work is meant to create the normal tension (psychological) that exist between male and female in everyday life. It also enhances the uniqueness of the work.

Plate 5.1: Gourd

Medium: Copper

Dimension: 220mm (height) x 142mm (width)

Year: 2008

5.4.2 Project 3 "Dzolali"

"Dzolali" is an art piece made of copper from a combination of the raising and spinning techniques. It was made in three parts and soldered together to achieve its final shape. The piece has two bowl-like shapes that were soldered together to form the base. The extension from the base that forms the upper part looks like a twisted funnel. The work when viewed from all angles looks symmetrical and balanced. The lower half is finished smooth while the upper twisted part is textured. The increase of size in the twist from the base of the funnel-like shape to the top depicts a form of growth and continuity into space. The band at the bottom of the work gives it a seat and makes the piece stable. The piece measures 230mm in height and 265mm in diameter.

5.4.2.1 Interpretation of Result

'Dzolali', an 'Ewe' word is a title the researcher chooses to illustrate his quest for freedom of artistic expression, and its power lies in its ambiguity. The ewe word 'dzo' meaning 'fire' is an element whose intensity a metalsmith cannot escape from. 'Lali' means "at once", it could also mean 'real' or 'tangible'. This same word 'dzo' means 'fly'. 'dzolali' therefore could mean "the fire is real" or "fly without hesitation"... 'dzolali'

Right from childhood, it has been the artist's dream to do something that stands out of the ordinary. There also comes a time in an artist's life when a conscious effort is made to bring out all the skills that have been acquired over the years. This is where the artist tries to tell who he/she is to the entire public. 'Dzolali' therefore comes to

illustrate the artist's freedom. A quotation about self expression from Sir Edwin Arnold which states that "within yourself, deliverance must be searched for, because each man makes his own prison" becomes a confirmation of this idea. The enclosed part of the piece represents prison whilst the twisted part symbolizes thinking out of the box and hence the freedom to express oneself.

The work also expresses the artist's determination to go the extra mile which brings to mind Adams Charles Francis's statement, that "no one ever attains very eminent success by simply doing what is required of him; it is the amount and excellence of what is over and above the required that determines the greatness of ultimate distinction".

Just in case one begins to wonder what extra mile the researcher has gone, it may interest anyone that spinning as an industrial process may stay with us for a while and raising is virtually becoming a thing of the past and it is in the production of such exclusive works using these techniques that the researcher/artist intends to keep alive the usefulness and benefits of these techniques to metal artists and to society in general.

Plate 5.2: Dzolali

Medium: Copper

Dimension: 265mm (height) x 230mm (width)

Year: 2008

5.4.3 Project 1 "Twist"

"Twist" is also a copper art piece made by the combination of the raising and spinning techniques. The work was made with a single metal piece by spinning a cylindrical container and then reforming it by the raising process. It has four diagonal lines that form the twist. The twisted lines run from a smooth bottom to a top whose edge is banded. This illustrates the artist's idea of the flexibility in the combination of the two techniques. The work has no front or back as it looks the same when viewed from all angles. The piece measures 200mm in height and 180mm in diameter.

5.4.3.1 Interpretation of Result

"I never knew that metal could also be twisted like we do in ceramics". This was an honest comment, naive though it might seem, made by a ceramist friend who visited the researcher's studio. Indeed the work looks like it was actually held and twisted as in clay. However, it has nothing to do with hand held twisting. I must confess however that, the motivation to produce the work "twist" through the combination of raising and spinning, comes from the idea of combining 'throwing and hand forming" techniques in ceramics. It is the viewer's experience in the physical world that informs him/her to feel the power of the seemingly twisted metal, consequently provoking questions of malleability of the metal. With this deliberate twisted movement, a psychological contradiction occurs confirming Vera Liskova's comment as cited by Mary Stewart in her book "Launching the Imagination" that, every material has a unique physical property as well as psychological associations. That is

metals are known to be solid at room temperature with the exception of mercury, but association with fluids, biomorphic forms and malleability of clay creates a contradiction in the minds of viewers. The "twist," apart from representing the idea of spinning, possesses a formal quality; a sense of movement which for the researcher symbolises continuity; continuity perhaps in the techniques of raising and spinning or a combination of the two.

Plate 5.3: Twist

Medium: Copper

Dimension: 200mm (height) x 180mm (width)

Year: 2008

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The previous chapter analyzed the project works. The present chapter summarizes the findings and draws conclusions. The aim of the project was to explore the raising and spinning techniques in hollow ware forming. The focus was to design and produce hollow ware using a combination of raising and spinning techniques of metal forming.

6.1 Summary

Raising, beating, joining, and casting were and remain the artistic methods used for shaping metals, although other methods such as spinning, have been introduced for industrial shaping. Most of these techniques are used individually for the shaping of hollow ware. This study has explored some possibilities of using the raising and spinning techniques in forming or shaping hollow ware. Designs were developed based on the facilities available and some of the works were produced with a combination of the raising and spinning techniques. This is intended to expand the scope of metal hollow ware fabrication to give employable skills to students, metal smiths as well as the unemployed.

6.2 Conclusion

The results of the study have revealed the possibilities of using a combination of raising and spinning techniques for hollow ware forming.

The Spinning process results in fine concentric lines on the surface of the work and this could be left on the surface of the work to create some form of textured surface finish if the necessary facilities are in place. In the case of this project, the researcher encountered some soldering problems which led to the flooding of solder on the surface of the work. The researcher therefore had to remove the solder from the surface of the objects by using an emery cloth thereby loosing the fine concentric lines on the objects. The researcher will also like to establish the fact that, the objects produced in this project are not necessarily functional pieces but art works that carry meanings and must be seen as such. Again the researcher thought it wise not to provide a secondary coating such as chrome or silver plating but to leave the works in their original copper colour so as to enhance their artistic value since the researcher's target was not on functionality. The result of this study provides hope for the metal artists and students of inquiring minds who want to explore raising and spinning techniques to produce unique metal products.

6.3 Recommendations

The benefits of combining raising and spinning techniques in the production of metal hollow ware will improve the socio-economic and artistic development of the nation. The following recommendations can be considered.

For anyone to undergo this project successfully, the researcher recommends that the person should have some basic knowledge in the areas of raising, spinning and wood-turning.

The researcher recommends that, Vocational institutions as well as Non-Governmental Organizations such as Aid To Artisans Ghana (A.T.A.G.), which are set up to help the artist, adopt this study for their training programmes since this would help create a whole new work for artists and thereby result in the reduction of unemployment problems and generate income for the nation.

Acquiring material (copper sheet) for the project was a major problem as there are no known shops that deal in copper sheets or plates in Ghana/Kumasi. The researcher therefore, recommends that, a conscious effort be made to publicise this subject which has the tendency to create a whole lot of revenue as business enterprises will begin to import copper sheets into the country.

The researcher also recommends that, the curricula development division of the Ghana Education Service should introduce this important art discipline into the

curriculum of second cycle institutions to foster creative and artistic development of students so that even those who are not able to pursue higher education can use this as an income generating venture.

The project report should be published by the university and copies made available in libraries and educational centres through out the country to serve as educational or research material and a guide to anyone who wishes to do further research in this area of metalsmithing.

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