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Design & Construction of A Tricycle as A Means of Transpotation

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PROJECT REPORT ON:

DESIGNATION AND CONSTRUCTION OF A TRICYCLE

AS A MEANS OF TRANSPOSTATION

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TO

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II

THIS PROJECT HAS BEEN APPROVED FOR THE SCHOOL OF TECHNICAL STUDIES, FEDERAL COLLEGE OF EDUCATION (TECHNICAL) GOMBE.

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DEDICATION

This project is sincerely dedicated to my beloved, Father, Mother, Brothers and Sisters, who despite all critical conditions gave me all required not only in my education pursuit but in all aspect of my life.

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ABSTRACT

The project provides guidelines on how to produce a tricycle as a means of transportation. Mild steel is used in the production of this machine the cost of production is less compared to the cost of producing electrically or mechanically operated cycles. The Project provides necessary information to any body willing to under take similar project. Chapter one deals with the design requirements, the deceptions of the components and their application. Chapter two explains the design procedure. Chapter three discusses the construction method, the various problems encountered at each stage and how they were solved. Chapter four deals with the evaluation of the design during and after construction. General comments on the design are obtained in cheaper five.

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CHAPTER ONE

1.0 INTRODUCTION

In our technological world today, designs and innovations have become the center of focus with the view to utilize and manipulate the resources available for the usefulness of the people through commercial and industrial realization.

The past systems of transportation were not a mere imagination but a result of sufficient means of transportation. This problem calls for technical contribution towards improving the means of transportation. This project aims towards improving a transportation system for the disabled. This machine is designed and constructed as front-steering, front drivers, ungeared-single driving cycle. It is designed to challenge the assumption that a great number of people perceive most Nigerian engineers, technicians and crafts men as only qualified on paper and theory work with little or no knowledge of practical work and hence cannot design and construct anything tangible to the society as their counter-parts in other parts of the developed country.

1.1 SCOPE OF THE PROJECT

Numerous attempts were been made by people to provide a means of minimizing the cost and problem of transportation. The origins of the basic ideas behind the pedal cycles were disputed. Certainly the possibility of light road vehicle propelled by human muscles-power had been considered centuries ago before the practical emergence of the bicycle in the 19th century. The first front steering, front driven ungeared tricycle was that of Bone-shaker (1868). A conventional tricycle is an assembly of a very large number of components ranging from frame, tubes, brake cables, spoke, nipples and ball-gearing e.t.c. These various components may of course be arranged in different ways to produce different cycle designs such as: bicycle, monocycle, tricycle and multi-cycles.

The tricycle design also takes into consideration the present high cost of materials, cost control is another major factor considered. Mild steel was chosen for the project because of its, strength, durability, malleability and workability for the materials to be treated to require shape.

1.2 SIGNIFICANCE OF THE STUDY

The importance of the students project is to convey the concepts of practical skills with some design project. The project is primarily designed to help students

acquire manupilative skills through knowledge on the importance of tricycle as a means of transportation. The tricycle is designed in such a way that it provides adequate stability i.e equilibrium thereby making it a very good and suitable means of transportation to the disabled. It has an advantage over that of mechanically or electrically operated cycles, since its effectiveness depends on the batteries or nay source to operate it. Tricycles are stable and may be driven by people of various ages (male and female). Tricycle can be designed to carry more than one rider or to transport loads. The project shall be of immense benefit to government agencies, corperate bodies and private individuals since the tricycle will provide a simple means of transportation more especially in the Agricultural sectors and part of rural development where petrol driving engines arc not available. Also with present high cost of vehicles, motor cycles e t.c One can be pleased to have a means which is simple to ride and easy to maintain.

DESIGN REQUIREMENTS

1.3 PARTS OF THE TRICYCLE, THEIR DESCRIPTIONS AND USES

A conentional Tricycles is an Assembly of a very large number of components. These components are of course been arranged in order to obtain the required object. Thus, below are the descriptions of parts that make up the tricycle:

HANDLE (PEDAL)

This is located at the front in a front-driving tricycle fastened to the crank. As the name implies, it provides the rider with a device to hold in order to control the direction of movement while riding and to provid ethe driving force (torque). It is also called the pedal. The handles are in pairs one for the right and while one for the left hand. For the handle to serve or perform its function smoothly and successfully a coarse handle cover is used in covering the handle to provide the necessary friction.

CRANK

The crank is a solid steel of about one feet length with a hole at both ends. The upper hole is threaded through which the handle is fixed while the lower hole was made in such a way that a cutter pin is used to hold the crank with the housing shaft. Like the handle the crank is in pair too. One for the right and the other for the left.

HOUSING

The housing is a Gollond metal easting which houses the shaft, holding the left and right hand crank. It also houses the ball bearing holding/supporting the shaft. The housing also provides point through which the hand fork fixed-in.

HANDLEBAR

The handle bar is a hollow casting with an internal thread at both ends nad two holes at the center. The handle bar is not more than one feet (1tf) long. The internal threaded part provides the means of lightening the hand fork with the handle bar up to the housing and the holes at the center are point through which the inclined support vbars were fixed into.

HAND FORK

Its name was driven from it being fork-like in shape but slightly curved with only two arms. It differs in length according to the diameter on the wheel to be used. The handle fork passes through the handle bar to the housing. It holds the entire wheel.

HUB

The hub is cylindrical in shape, made up of a stainless steel. The hub contains a spindle threaded at both ends. The threaded ends create provision for setting and lightening the wheel with the fork. The hub also houses a ball-bearing which makes the efficiency of the rotation high. It is the hub that provides small holes all round through which the spokes were fixed to the Run.

CHAIN WHEEL

The chain wheel is fixed at the top end of the front arrangement. It is circular in shape about six inch (6inch) radius. It has a geared like teeth at its edges through which the chain run over.

CHAIN

This is an arrangement of many parts linked together to produce a chain of required length. Among the parts linked together are stud, link plate, Roller and bush.

The above mentioned parts if assembled to requirement wil produce either rof the following: Early stud or pin chain, margin pin chain, Roller chain and or

Roller-Bush chain. The chain function in power transmission from the chain wheel to the sprocket.

SPROCKET

The sprocket is similar to the chain wheel in shape, but there are some identical differences, which can be easily discovered if studied well. The sprocket is about two inch radius and it has an internal ball-bearing ratchet arrangement which allowed it to fit the wheel only when the rotation is in clockwise direction and to be in idle state when the rotation is in anticlockwise direction.

SPOKES

The spokes are flexible wires. In a wire spoked wheel the weight of the rider and cycle frame is 'suspended' from the rim through the upper spoke and reduces it in the lower spoke. The tension in each spoke is adjusted by means of a screw nipples which connects the spokes to the rim.

RIM

This is often called the wheel rim because it absorbs the vibration of the wheel. The wheel rim remain cicular because all the spokes are in tension. Physiavclly the wheel rim is circular '∪' (vcc) shaped steel.

TYRE

The popularly used tyre in cycles is known as the pneumatic cycle tyre. The pneumatic cycle tyre come into existence when welnch-dunlop, wired on detachable tyre of (1980) was launched. The tube inside contains air filled through the valves through which the inflation of the tyre is determined.

MUDGUARD

As its name indicates, it serves as a guard to prevent mud or dust sprinkled by the wheel from coming into contact/falling on the rider or thr body of the cycle.

SEAT/SADDLE

The seat is an important part of the tricycle which provides the rider with a very comfortable seating posture for smooth and successful riding of the cycle. The seat comprises the carcase frame, the foam and the seat cover.

CARRYING RACK

This is also known as the carrier. It is used as a luggage carrying device.

FRAME

A cycle frame should be as light a structure as possible it should be strong enough to withstand the load it is expected to carry and stiff enough to prevent undue flexing or distortion under load. The frame of this project is made from hollow metal pipes which make it strong and lighjter than one made of solid members for the same strength and stiffness.

1.4 REQUIRED TOOLS AND EQUIPMENT FOR THE JOB AND THEIR USES.

During the construction of this project there were required tools and equipment to be used in the production and construction. All equipments/tools needed are listed. It will safe time and energy if all necessary materials are obtained before the work is started on the project. The following are some required tools and equipments which were used during the production/construction of this project:

1. Scriber
2. Hammer
3. Bench vice
4. File
5. Hacksaw
6. Steel rule/Tape rule
7. Engineering Square
8. Screw Driver
9. Spanner
10. Pipe Bender
11. Angle/ Hand Grinder
12. Drilling Machine
13. Welding Equipment

1.5 FUNCTION OF THE ABOVE LISTED TOOLS/EQUIPMENTS

SCRIBER.

This is a marking out tool made of high carbon steel, hard and temper. It is used for making a mark or line on a metal with help of other marking out tools such as the steel rule and the try square. See appendix two (2) for the specification of this tool.

HAMMER

The main function of the hammer is that of general purpose of riveting, bending, folding of sheet metal e.t.c hammer is short listed among the group of percussion tools. See appendix three (3)

BENCH VICE

It is fastened near the edge of a bench. The top of the vice should be level with the worker elbow when positioned for filling. The bench vice jaws are made of hardened steel serrated on the inside to give a good grip and removable so that they can be replaced when they are worn out. The bench vice is always used to clamp or hold jobs when bending, filling, tapping, cutting and also assembling are carried out on it.

FILE

It is one of the hand tools use by a bench worker in a metal workshop by robbing with the teeth of the file, this filing can be either on flat surface, holes, slots or round corners, finishing square and rectangular holes, slots e.t.c. depending on the type of work piece the required file should be used. See appendix four (4).

HACKSAW

Metals can be cut to size by several methods, including: chiseling, frame cutting e.t.c. The hacksaw is the chief tool used by a fitter on the bench for cutting engineering materials to any required size before performing the next operation. See appendix five (5).

STEEL RULE/TAPE RULE

This is the most commonest basic measuring instrument found in an engineering workshop. It is used for measuring the distance between two points. The steel rule functions in measuring short distance while the tape rule is used for measuring long distance of about thirteen feet (13fts).

ENGINEERING SQUARE

The engineering square blade and stock are both made of metal riveted together at 90^0 . it is used to check angle for squareness i.e for

checking that one surface is squared to another and to enable lines to be marked at 90^0 to an edge. See appendix six (6).

SCREW DRIVER

The screw driver is made from tool steel, hardened and tempered at the point. The set of screw drivers differs from the head shape. The screw driver is used for driving-in or driving-out screws with slotted head.

SPANNER

This is an instrument used for tightening or loosing nuts and bolts on a components. The spanner is of different shape and sizes.

PIPE BENDER

This machine is very important as far as the framework of this project is concern. It is used for bending round pipes to required angles.

HAND/ANGLE GRANDER

This is a portable tool which works like the grinding machine, because it is handy, it is used in grinding angles, edges and surfaces which cannot be done with the grinding machine.

DRILLING MACHINE

This is the most common tool used for making a hole in a material. The operation is called drilling and the tool used is called Drill. Drills have been designed for different applications.

WELDING EQUIPMENTS

These refer to those tools that facilitate welding operation such as: wire brush, clipping hammer, eye goggle, head shield, plier and the welding machine itself.

CHAPTER TWO

2.0 DESIGN PROCEDURE

In every design to be carried out one must know the right thing to be produced, the functions of the various system, size, the material to be used and the theory of detailed account of the system.

2.1 FUNCTION OF THE SYSTEM

The tricycle is designed in such a way that it provides adequate stability i.e equilibrium there by making it a very good and suitable means of transportation which can be ridden by people of various ages and by both sexes. Mounting, dismounting and stopping are easy and convenient. The tricycle is made up of the following major parts.

-Frame

-Chain drive

-Wheels

i. FRAME

The frame can be seen as a rigid structure of the device. Which makes its shape and gives a support for all parts. In another version the word frame refers to a general order or system that forms the background to something of parts. The tricycle frame, like the conventional diamond frame is subjected not only to loads in the plane of the structure, but alos to

the out of plane loads produced in the riders alternate pushes on the pedals thereby resulting to more distortion under the bending and investing stresses produce by these out of plane loads.

The cycle frame in a geberal should ideally be a light structure as possible. It should be strong enough to withstand the load it is expected to carry and stiff enough to prevent. Undue flexing or distortion of the frame under load. The design of cycle frame to meet these requirements is quiet a complex topic, so only a few essential points were discussed here. The frame of an early ordinary bicycle consisted of a solid iron with with rear forks at the lower ending forming what is essentially a simple beam subjected to bending and to compressive stress. To be sufficiently strong the frame has to be heavy. The problemis, how can a simple cycle frame such as this be made lighter and yet remain sufficiently strong and stiff? There are several possible approaches such as:

-USE-LESS-MATERIALS

This may be achieved by using a hollow frame instead of a solid frame. A frame made from solid members can be much lighter, than one made from solid members for the same strength and stiffness. You can appreciate this if you think of the difficulty of bending a piece of tubing compared to that of bending a solid rod made from the same weight of

material. In fact, this walled tubes of circular cross-section which have been used in cycle frames since make highly efficient structural members, since they can resist not only tensile and compressive stresses, but also are effective in resisting the stresses produced in bending and torsion that act on cycle frames when in use. The lightest frame use 'butted' tubes, which are thicker at their ends than in the middle section. (appendix 8) so as to sustain the stress concentrations at the joints under the load.

Design the structure so that its members are as far as possible intention or compression rather than in bending or torsion (twisting) you can appreciate why it is important a to avoid bending and torsional stresses in structure if you consider how easy it is to break a match stick by bending or twisting it, but virtually impossible to pull it apart (or compress) with your bare hands. A structure in which the members are arranged in triangles is subjected to compression and tension when loads are applied on the plane of the swtructurc. Thc design and construction of this project is based on these above approaches.

CHAIN DRIVE

Chain and sprocket drive is a very important methods of transmitting power which was only perfected after its application to cycles from the 1870s onward. Chain drive works in the same way as belt drive,

but chains are used instead of belts and the edges of the wheels are cut with teeth which engage i8n the links of the chain. The wheels are called sprockets, examples of chain drive can be founds on lawn-mowers and loads, which explains why the driver sprocket (the chain wheel) is always larger in diameter than the driven sprocket

Chain links were accurately depicted by Leonardo Dominic in the fifteenth century, but the first proper chain and sprocket did not appear until the late 18^{th} century. Early pin or stud chains, in which pins bore directly on the sprocket teeth and link plates swiveled on studs at the end of the pins, were widely used to drive textile machinery up to the 1860s. drives using these chains, however, were subjected to heavy wear and friction at the sprocket teeth and at the studs jointing the pins to the links plates. (appendix 9 shows the diagram).

Several other types of chain were tried; early triangles used the Morgan .chain, which consist of the alternate rectangular links and hollow rollers (appendix 10). An improvement patented by j. Slater in 1864 was the bawl of roller chain (appendix11) friction and wear at the sprocket teeth were reduced by rollers placed over the pins, but wear on the studs and links was still heavy. The definitive solution was invented by Hons Renolds in 1880. Ronald's bush- roller chain (appendix 12) overcome the

short comings of the roller chain by the engines addition of a pair of a tubular sleeves (or bush) joined by inner link plates placed between the pin and the roller. The bushes not only serve as bearing for the rollers, thereby reducing friction and wear on the pins, but alos reduces the stresses acting on the studs.

The bush-roller chain was rapidly adopted after 1880 by tricycle and bicycle manufacturers. It soon spread to other applications of the modern precision chain industry. The chain drive has a great advantage because the belt ships in the event of an excessive load, but the chain does not. For this reason, the chain can drive for a much longer period of time than the belt without attention. Though at high speed they can be noisy.

iii. THE WHEELS

a wheel is known commonly as a circular, object that turns around a rod at its center, as on cars, bicycle e.t.c. wheel construction must fulfil a number of requirement as follows:-

- STRUCTURES

Wheels should be rigid, so that they retain trheir shape under all operating conditions. If they are subjcetd to impact, they must not shatter or collapse but should preparably buckle. The dimensional tolerance of the

wheel should be sufficiently accurate to provide wheel alignment for the wheel to be balanced.

- WEIGHT

Wheels should be made as light as possible, to reduce the unspring weight, light wheels and tyres will follow the road surface irregularities move accurately and so minimized wheel bounce, which should resolve in improved road-holding and reduced tyre wear.

- TYRE ATTACHEMENT

the wheel must be designed so that the tyre can be fitted easily and be firmly located and secured. This is necessary since the wheel-tyre combination forms the path for the transmission of traction to the road or for stirring reaction.

- WHEEL MOUNTING

The wheel attachment must perform the job of locating, securing, and supporting the wheel, and should allow the wheel to be fitted or removed from its hub.

- COST

Wheels should be made out of materials which is cost less and can easily be fabricated, cast or forged and which required minimum amount of machining to bring the wheels within the necessary dimensional tolerances.

The chosen should readily deteriorate with age and Weathering or, if it is susceptible to corrosion. It musty be provided with protection treatment which should also improve its finish and appearance.

2.2 CYCLE WHEELS

Early cycle wheels were based on carriage which with wooden rims, iron types and rigid wooden spokes. They were heavy and did not absorb vibrations from the road, hence the term bone – 'shaker ' for the cycle equipped with such wheel in 1868. the idea of a suspension wheel with flexible wire spokes was patented by E.A Cow per in wire – spoke wheel , the weight of the rider and cycle frame is suspended from the rim through the upper spoke. The wheel remain circular because all the spokes are in tension, but the weight supported at the hip increases the tension in the upper spokes and reduces it in the lower spokes (appendix 13). The wired – spokes tension was much lighter than the old wooden wheel and when equipped with solid rubber or curliness rubber types, could absorb road vibrations. In cross – section the spokes are arranged as in appendix 14. forming a triangulated structure able to sustain side ways forces on the wheel.

The draw back of the tension wheel with spokes arranged racially, as appendix 15, is that, when use as a driving wheel, it is not able to transmit

the torque exerted by the pedals (on the chain drive) from the hub to the wheel rim. This is because all the forces act radically through the center point of the hub and there are no forces to prevent the hub rotating relative to the wheel rim when a driving (or braking) torque is applied

The weakness of radial wheels was overcome when James Stanley patented the tangent spoked wheel in 1874. In a tangent wheel the spokes are arranged at an angle to the hub and fixed a small distance from the center. The tension in each spokes thus, exerted a turning force on the hub that can resist an external driving or braking torque. The wheel as a whole is kept in equilibrium because for each spoke laid in the forward direction there is another spoke balancing it laid in the backward direction. The tangent spoked wheel therefore forms a structure braced against the torque exerted by either acceleration or braking. It supports the weight of the cycle and rider. The tension in each spoke is adjusted by means of screw nipples, which attach the spokes to the wheel rim.

The tangent spoked wheel formed the definitive solution to the problem of providing light and rigid cycle wheels and was rapidly adopted by manufacturers after its introduction. Radial spoked wheels are still in use today.

2·3 SELECTION OF MATERIALS

For any set – up to be successful, there must be good management of both the material and human plus energy (machine) resources. Good materials, machines and time were to be selected for the execution of the project. The following are some factors considered when selecting material for this project:-

KNOW THE JOB TO BE PERFORMED BY THE PROJECT:

This point is trying to explain to us that if you know what function the structure is going to perform then you will equally know the mechanical and the physical properties in which the materials to make such structure must posses. And also through the knowledge of the above one will know which types class of tools to be used.

AVAILABILITY OF MATERIALS:

After knowing the materials to be used in construction, there is need to know if the materials chosen are available in the market. Incase of non-availability of the materials then immediate alternative source has to be provided.

COST OF MATERIALS:

In carrying out any project, the costs of materials have to be considered

IV STRENGTH AND DURABILITY

Before any structure is erected or constructed this very factor must be considered and to know more on this the following questions should be answered!

- What type of force will be exerted on it?
- Can it be subjected to stresses?
- If yes, then how? And which kind of stress is that of bending, compression, torsion etc

And so, the materials selection should be based on the answers gotten above **WALKABILITY.**

After all necessary information based on material selection have been noted then, the ability to successful work with tools available on that material has to be considered too. It is here that the mechanical and physical properties of materials will be considered

Vi QUANTITY OF MATERIALS

After all the necessary facto9rs listed above have been considered the next, is the purchase of materials. it is very important to know the quantity of the materials needed for the project

2.4 CUTTING LIST

A cutting list or table of specification is the serial statement of all the pieces to be used in

Construction. In the other hand it is the comprehensive element of the complete project. It is important to list the items needed because it gives the size of each piece/measurement needed for the construction of a project. The cutting list for this project is shown below:

ITEM	DISCRIPTIONSS	QTY	LENGTH	HEIGHT	THICKNESS	MATERIAL
1	Wheel	1	024 inch	-	-	Steel
2	Wheel rim	2	028 inch	-	-	,,
3	Tyre/tube	1	024 inch	-	-	Rubber
4	Tyre/tube	2	θ 28 inch	-	-	,,
5	Spoke	40	24 inch	-	2mm	Steel
6	Spoke	80	28 inch	-	2mm	Steel
7	Hub	3	Standard	-	-	Steel
8	Chain	1	Double	-	-	Steel
9	Crank	2	1 feet	-	2 inch	Cast iron
10	Handle bar	1	Standard	-	-	Cast iron

11	Electrode	½ Dozen	-	-	10 guage	-
12	Paint	I tin		-		Black
13	Sheet metal	1	S.N.G 20	-	-	Mild stee
14	Filler rod	1 roll	-	-	-	Mild stee
15	Welding equipment	1	-	-	Complete	-
16	Seat	1	15 inch	16 inch	3 inch	Wood
17	Arms rest	2	15 inch	13 inch	-	Galvaniz d pipe
18	Seat rest	1	15 inch	16 inch	-	,,
19	Flat bar support	4	30 inch	-	5mm	Mild stee
20	Base long rail	2	30 inch	-	1 inch	,,
21	Base short rail	3	25 inch	-	1 inch	,,
22	Foot rest long rail	2	31 inch	-	1 inch	,,
23	Foot rest short rail	5	15 inch	-	1 inch	Mild stee

CHAPTER THREE

3.0 CONSTRUCTION DETAIL

All the cut out materials were joined together by the process of are welding. This process was used because it enables goods penetration; adequate welding length and it enhances fusion. All the weldings were fillet welds and as such they require little or no penetration of the joints. The gauge of the electrode used was 10. During the welding processes, the slag used to be chipped off or removed to enable fussion weld to be made on top of the former since bars a thick enough.

The construction of this project (TRICYCLE) Consist of the following requisites operations:-

i. Measuring/marking out
ii. Cutting
iii. Bending
iv. Welding
v. Assembling

3.1 OPERATION PROCEDURE /PRINCIPLES

OPERATION SHEET N0 1

TITLE: Measurement/marking out.

TOOL/EQUIPMENT:

-Engineering square

-Steel rule

-Tape rule

-scriber

PROCEDURE:

The tools listed above were used for measuring and marking out before cutting during welding process. The engineering square is used to mark a straight edge-line, from which the measurements begin. The tape rule is used in determining the distance. Scriber was used to scribe or to mark the dimensioned/measured distance on the pipe. The engineering square was used in marking the edge at 45^0 for beveling.

3.2 OPERATION SHEET NO. 2

TITTLE: CUTTING

TOOLS/EQUIPMENTS:

-Hacksaw

-Bench vice

-Bench shear/glutine

-Cold chisel

-Hammer

PROCEDURE:

The next operation after marking out is the cutting operation. The Hacksaw was the main tool used though some times power saw was used to save time and energy. The work pieces were changed on the bench vice and then using the hacksaw the work pieces were cut to required sizes (for the pipe) but for cutting the sheet metal the bench shear and the guilo were used instead of the hacksaw. Chisels were were used for cutting round/circular holes e.t.c.

3.3 OPERATION SHEET NO. 3

TITTLE: Bending

TOOLS/EQUIPMENTS

-Pipe bender

-Folding bar/bench vice

-Hammer

-Engineering square.

PROCEDURE:

The bending operation was limited to the round hollow pipe and the sheet metal only. Using the mathematically operated pipe bender, the pipe was laid on the bending shoe considering the mark and the bending allowance. After positioning the pipe, locking pin was then used to hold

the parts in position. The arm was then used to press the pipe to the required angle.

3.4 OPERATION SHEET NO. 4

TITTLE: WELDING OPERATION

TOOLS/EQUIPMENTS

- Electrical are welding machine
- Welding electrode of guage 10
- Filler rod
- Clipping hammer
- Wire brush
- Engineering square.
- Hammer
- Hand glove
- Welding goggle/eye shield

PROCEDURE:

After the cutting and bending have been done, the parts were put together as follows: the first stage in this operation was the preparation of the welding area. After that the square pipes were joined as shown in appendix 16. flat bars were then laid across as in appendix 17. the arm rest

and the seat rest were joined together to produce the frame (main body) as shown in appendix 18.

3.5 OPERATION SHEET NO. 5

TITTLE: ASSEMBLING

TOOLS/EQUIPMENTS

- Spanner
- Screw driver
- Grease
- Scraw nipple
- Lubricating oil

PROCEDURE:

Assembling is the stage where all the components were brought together to produce a conventional tricycle. For easy assembling, the rear wheels were fixed first to the hand hub and then tightened with the help of spanner. After that the front components were coupled on a table before fixing to the frame. During coupling, the wheel came first to the hand fork which was attached with the handle bar, and later to the housing.

The crank was fixed to the housing where it joined the other hand crank which is attached with the chain wheel. The handle was fixed to the

crank too. After all the parts have been put in place the chain was fixed and greased. The seat was mounted and screwed using the screwdriver.

After all the components were mounted together, all moving parts were lubricated with appropriate lubricating oil. The diagram of the assembled tricycle is shown in appendix I.

3.5 MAINTENANCE

Maintenance refers to an act of carrying out systematic support services on any device. Maintenance generally, is the up-keeping of properties of equipment and device for efficient use to prevent available failure and it is usually preventive in nature. Therefore for the up keeping of properties and prevention of failure of this project the following have to be noted:

i. Cycle wheels are always subjected to broken spokes, so they should always be adjusted properly i.e should not be less or over tensioned.

ii. Chume-plating and painted steel often corrode if the cycle is left outside. To ensure effective maintenance of the cycle, it has to be stored or kept in a proper condition.

iii. Frequent adjustment of the break and chain should be made for effective and sufficient performance

iv. There should be proper and regular lubrication of gears, chains, pedals, bearings e.t.c

3.7 PROBLEMS ENCOUNTERED

Generally during my project execution there must be some major and minor problems to encounter. Among the problems encountered were:

The first was that of fund. For many years ago this problem had been in existence in so many tertiary institutions of learning including this college. Lack of financing students' project is a barrier to development technologically.

The second was that of equipments. Material/equipments were grossly inadequate. Students have to go outside the college workshop to perform some of the operations e.g pipe bending.

The third was lack of reference materials. The college library has little or no materials on design process and production. This cripples students' effort in making research.

The last but not the least was that of limited time. The time given for the project was very short.

SOLUTION DEVISED

The first step taken to overcome or to find solution to the lack of fund was that the students who undertook this project taxed themselves and purchase almost all the parts required for the project.

AMENDMENTS CARRIED OUT

During the course of construction of this project, despite the problems encountered there was no much amendment of the design except that of back hub hand position.

CHAPTER FOUR

4.0 EVALUATION

This chapter is mostly concerned with the evaluation process of the project. This involves testing parts for accuracy as well as effectiveness. Every component was tested after construction through the methods below:-

4.1 PROCESS EVALUATION

This was carried out during the construction process, which involved checking the dimension of the parts by using tape and steel rule, and it was found that the joints were accurate and appropriate. During the construction process, trial assembling was done to ascertain the square ness of the joints. It was carried out using the engineering square.

Inspection of the welded joints was among the process evaluation carried out. The checking of the welded joint was done using clipping hammer to remove clips for physical inspection.

4.2 PRODUCT EVALUATION

This was carried out on the final assembled product in order to test its strength, stability, functionality and effectiveness. Here, the tricycle was tested by putting it on road for a test to cover a distance of about

100meters. This was done to find out whether there was stiffness or hooking of moving parts.

CHAPTER FIVE

5.0 CONCLUSION

In conclusion, as earlier stated, the primary purpose of designing and construction of the tricycle is for providing means of transportation.

This report also contains most of the workshop basic operations and procedures that show in details the sequence involved especially where the project has to do with welding. However, the evaluation of the finished product was made to ascertain if actually the project is functional and the purpose for which it was made has been achieved or not. Anybody who followed the outlined procedures carefully as stated in this project would surely not have any problem or difficulty in producing something like this.

The need for safety precautions cannot be overlooked in constructing and operating a machine. So workshop safety rules and regulations such as wearing of proper overall goggle, safety boot and concentration on the work should all be observed. These can prevent accident and damage to equipment/tools.

5.2 RECOMMENDATION

To enhance economic and technological growth I recommend that the school authority should purchase more equipment, tools, and materials

to the various workshops so that students would have enough tools when carrying out their practical projects.

Finally, the school should provide enough financial support to the students when it comes to projects.

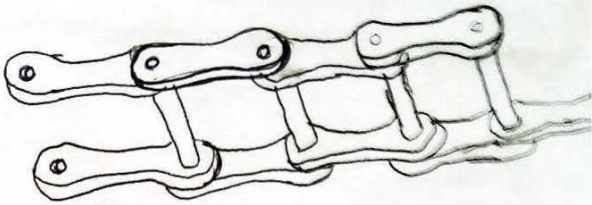
5.3 HINTS FOR FURTHER IMPROVEMENT

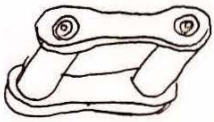
This project has been constructed to serve as a means of transportation. Below are the deficiencies, which can be further improved:

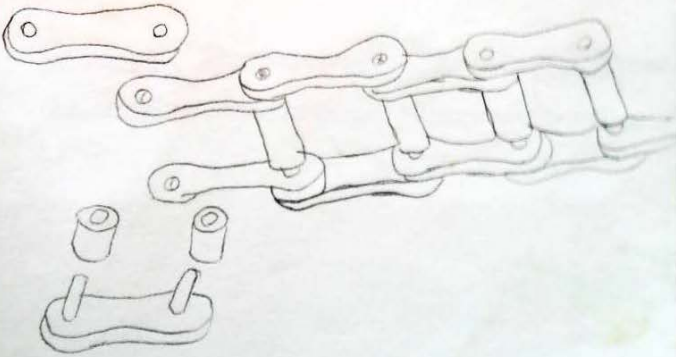
i. For comfort ability, shock observers can be introduced to the cycle wheels.

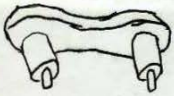
ii. When cycling the chain may stain clothing with oil. So there should be provision for chain cover.

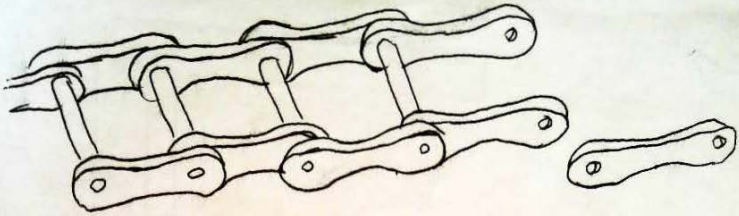
iii. For convenience, there should be provision for adjustable seat.

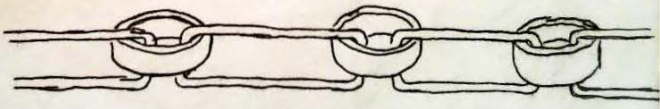


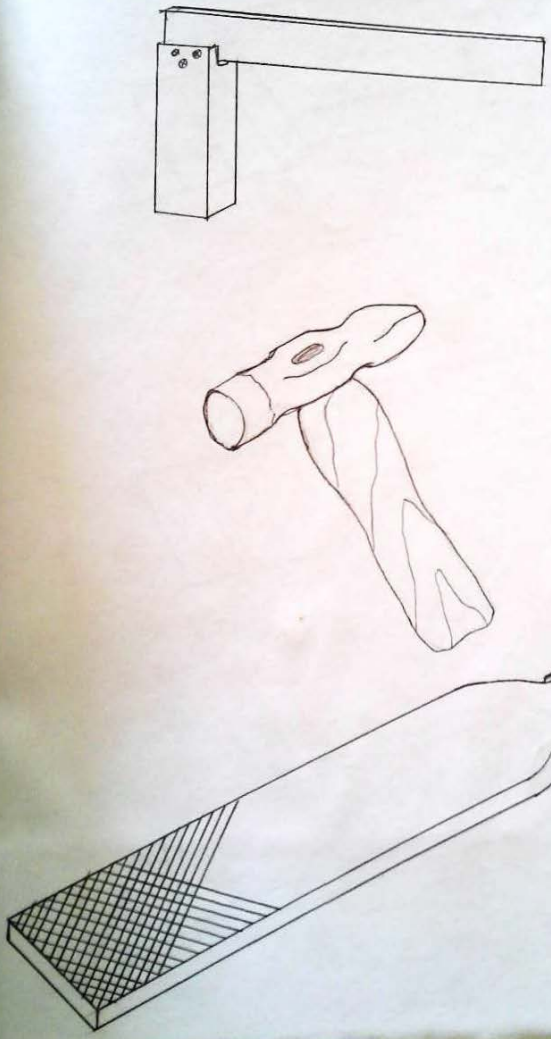


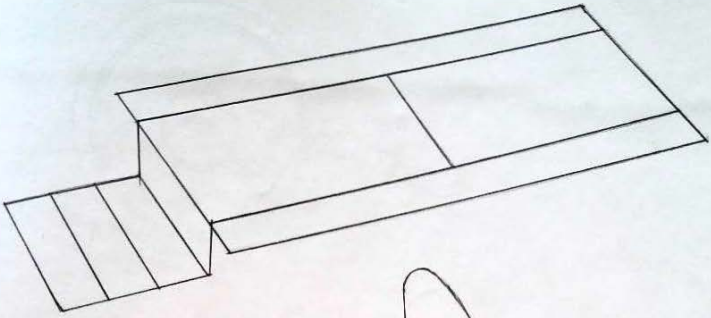


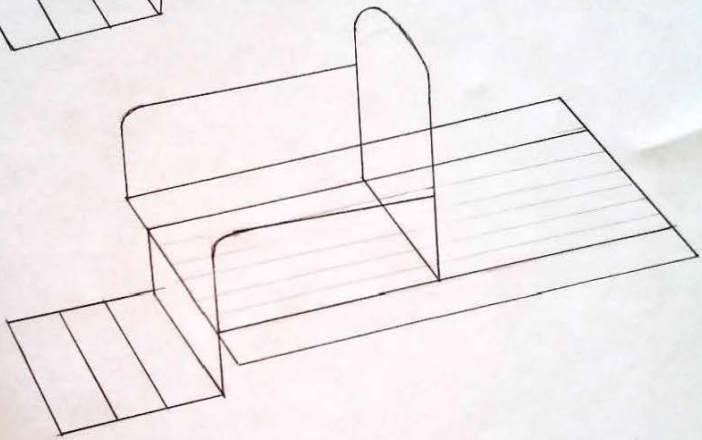


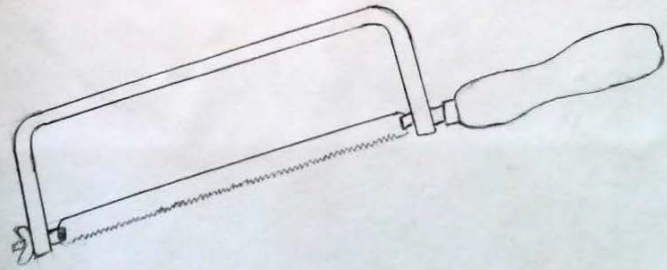


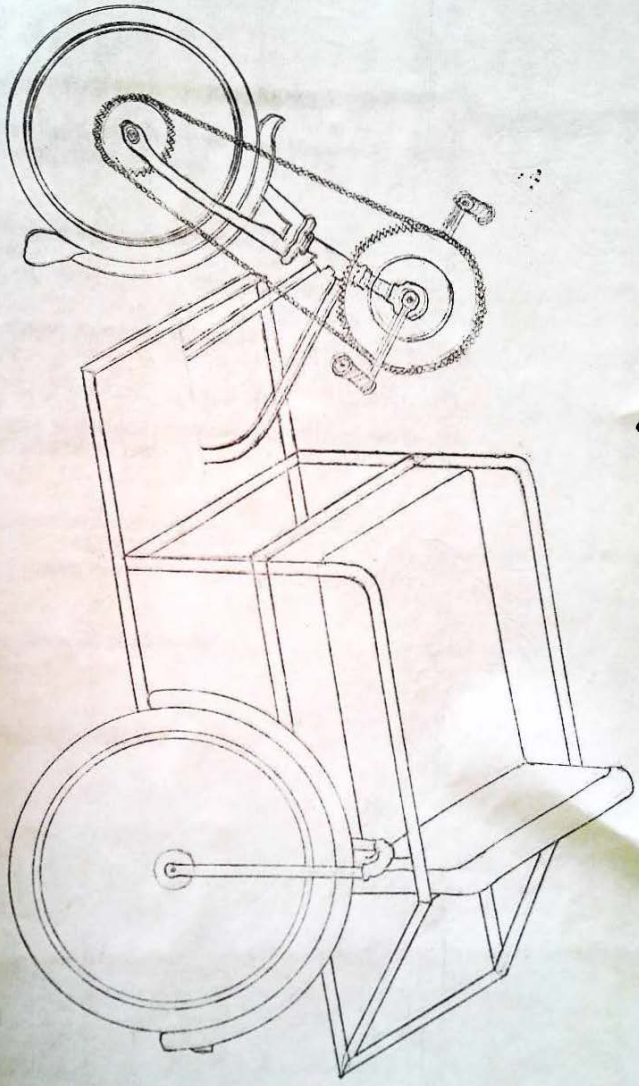












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