KWARA STATE POLYTECHNIC

FABRICATION OF GRINDING MILL

BY

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ND/23/MEC/PT/0061

A PROJECT SUBMITTED TO DEPARTMENT OF MECHANICAL ENGINEERING

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA (ND) IN MECHANICAL ENGINEERING, INSTITUTE OF TECHNOLOGY, KWARA STATE POLYTECHNIC ILORIN, NIGERIA.

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CERTIFICATION

The undersigned certified that this project report prepared by

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Titled: "Fabrication of grinding mill" meets the requirement of Department of Mechanical Engineering for the award of National Diploma in Mechanical Engineering.

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External Supervisor **Date**

DEDICATION

This project is dedicated to Almighty God who has leaded us throughout our National Diploma (ND) program.

ACKNOWLEDGEMENT

All praise and adoration to Almighty God for His infinite mercy on us.

We acknowledge the effort of our supervisor Engr. Yusuf Ibrahim for giving us the opportunity to work on this project under his supervision, support, guidance and encouragement from initial stage to the end has enable us to understand the concept of this project work.

Not forgetting our HOD Engr. Ayantola A.A for the moral knowledge he gave us and all our departmental lecturers, workshop technicians, technologists and non-teaching staffs for their support.

ABSTRACT

The project titled Fabrication of Grinding mill, is constructed to solve problem of olden day method of grinding e.g grinding stone, which is unhygienic for human consumption, time and energy wasted process of grinding.

Various improvement has been made to make grinding easy and safe for consumption. These include mortar and pestle used by the Egyptian house wives, pushing milling donkey mill etc. all these improvement is unhygienic and time wasting process, there by leading to the mechanical invention of Grinding mill both electrically and manually operated, to make grinding faster and free of contamination that occurs using olden means of grinding.

There are more development after this which are smaller, faster and more hygienic for grinding of grain crops for human consumption. The usefulness of the machine cannot be over emphasized has its serves as personal and commercial purpose.

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CHAPTER ONE

1.0 INTRODUCTION

The project titled fabrication of Grinding mill is designed for grinding domestic food stuff such as grain crops and others e.g maize, beans, melon, pepper, tomatoes, onions e.t.c for human final consumption as may desired.

The machine was developed to prevent energy wastage and time consuming during the process grinding when using grinding stone, which is used in the olden days.

There is need for invention of different types of grinding mills, which may be electrically or manually operated, due to the needs of grinding food items.

The grinding stone method lead to increase in contamination of food by stone particle from the grinding stone process which make food stuff to be unhygienic.

The usefulness of the machine cannot be over emphasized as it has find solution to the long lasting problem of grinding process in our society.

1.1 Aims And Objective Of The Project

To improve practical knowledge of student on how to use various types of tools and machines in workshop properly.

To ease the grinding of food items

To save time and energy expended in grinding.

To acquire practical skills in the construction of projects.

1.2 Literature Review

In the olden days grinding operation is carried out using different method such as grinding stone. Mortar and pestle ect, the process is slow and unhygienic for human consumption.

This gives birth to the saddle as another method of grinding introduced by the Egyptian house wives about 4000 years ago.

Pushing mill is another means of grinding developed, the machine is made up of two different stones, one is grooved shoe and the other is smooth. The stuff to be grind is fed through the hollow passage into the grinding surface.

The development of "Rotary mill" came in after the pushing mill, which was invented by association of professional millers. The spread of Rome were accustomed to grain grinding using the mills.

Large mills known as the "Donkey mill" lead to the existence of reducing the grinding problem man is encountering during grinding operation.

The wind mill is another means of grinding, originated from the people in the seventh century A.D. This serves as a source of power. This machine was developed also to eliminate grinding problem.

CHAPTER TWO

ANALYSIS OF ALTERNATIVES TO MULTI POSE

POSEGRINDING MACHINE

2.1 Grinding Stone

This consist of saddle and flat stone to be held in the hand for grinding process, usually grooved to catch sheared grains.

Grinding stone, has it was first thought to and the idea was welcome, but later discovered that the process is stressful and time consuming, with very low grinding efficiency and nor hygienic for consumption.

2.2 Manually Operated Grinding Machine

This is made up of hopper where the grinding materials is first poured the crushing unit whenever the grains is crushed through the orga barrel before it is driven by the orga shaft to the grinding unit, the grinding unit that consist of two grinding disks (stationary and rotary disks) and the discharged spout through which the material is collected.

The manually operated machine was developed to comfort and reduce the problem encounter while using

electricity is unavailable in our society. The actual aim of developing the machine was not really achieved as its involved human effort to grind but still is an improvement over the grinding stone.

2.3 Choice of Alternative

The Grinding mill that has been analysed above cannot meet the ultimate increase challenge by people, because of the material the grinding stone is made up have no long life span.

The physical labour and stress encountered by the alternative like manually operated machine.

Then comes the invention of electric motor driven grinding machine or an internal combustion power engine that uses fuel can also be combine suring failure of electricity. In view of all these development to solve human related problem, the project suit the choice of people especially now that electricity and internal combustion power engine fuel are now becoming widely spread, hence increases productivity.

CHAPTER THREE

3.0 GENERAL DESCRIPTION AND WORKING PRINCIPLE

1. THE HOPPER UNIT

2. THE CRUSHING UNIT

3. THE GRINDING UNIT

4 THE COLLECTION UNIT

5. THE STAND

1. **THE HOPPER UNIT**:- Is the biggest unit in the grinding machine, is serves as housing and guides the stuff to be grinded in an hygienic manner to the crushing unit from proper crushing.

2. THE CRUSHING UNIT:- The crushing unit consists of a space housing the shaft, a helical profile is welded on the shaft, as the shaft rotates the helical profile moves and crushed the stuff in readiness for proper grinding.. It then carries it along its axis to the grinding units.

3. THE GRINDING UNIT:- This is the unit where the main aim of constructing the machine is achieved.

The unit consist of two different disk, one of the discs is stationary while the other is in rotary motion

The disc that rotates performs the grinding operation when is in engagement with the stationary disc

4. THE COLLECTION UNIT:- This is constructed to prevent splashing of grinding stuffs or pepper and provide easy collection out the system as the name implies collection unit.

5. THE STAND:- The stand is constructed to carry the machine and also for easy transporting of the machine from one place to another.

CHAPTER FOUR

4.0 DESIGN CALCULATION

$$L = 2C + 1/2 (D + d) + \frac{(D-d)}{4C}$$

Cave (Cmax + Cmin) x ½

Cmin = 0.5 (D+ d) + t

Cmax=2 (D+ d)

Cmin=0.5 (165+50) +6

0.5 (215) +6

107.5+6

113.5mm

Cmax=2 (165+50)

2 (215)

430mm

Cave (430+113.5) x ½

543.5 x ½

= 271.75

= 272mm

$$L=2 \times 272 + \pi/2 (165 +50) + \frac{165-50}{4 \times 272}$$

544 + 1.571 * 215 + 0.1057 544 + 337.8 + 0.1057 = 882mm

C^2 = 1/4 * (L*pi(r_{1} + r_{2})) ^{2} _ (r^2_{2} - r_{1}) ^ 2 C ^ 2 = 4 * (882 - pi(25 + 82.5)) ^ 2 - (82.5 - 25) ^ 2 (882 - 337.7) ^ 2 - (57.5) ^ 2

4 (544.3) ^ 2 - (57.5) ^ 2 (296262.49-3306.25) Sin82.5-25 271 57.5=0.2122 271

% (292956.24)

C ^ 2 = 73289m * m ^ 2

C = sqrt(73239)

C = 270.6 = 271mm

Sinr-r X

Where x = c

Sin10.2122 12.30

o = 180 - 24.6 = 155.4° angle of lop in radian (155.4 * 2pi)/180 5.425 radian T=T-T T=6xa Tc = M * V ^ 2 Where V = rw W = (2pi*N)/60 T = 2.5N / m * m ^ 2 * 5260.2m * m ^ 2 = 13150.5N TC = M * V ^ 2 V = 1440 * (2pi)/60 * 0.025 = 3.7704 m/s Volume Lxbxt = 882 x 14 x 6

0.074088m³

M = 0.074088 * 1.06 M = 0.0785kg Fc = 0.0785 * 14.216 1.116 KN = 1116N T_{1} = 13151 - 1116

T_{1} = 12035N

2.3 log T_{1}/T_{o} = mu*theta Cosec B

2.3 log T_{1}/T_{0} = 0.3 * 5.4 * 1/5

2.3 log T_{1} = 1.62 T2 Cos 2.7

2.3 log T_{1}/T_{2} = 1.62 Log T_{1}/T_{2} = 1.62/2.3 Log T_{1}/T_{2} = 0.7051 T_{1}/m = log(0.7051) ^ - 1

T_{1} = 5.071

Therefore, the machine is tested using electric motor of 4.8

hrp from the calculation above.

4.1 PRECAUTIONS AND MAINTENANCE GUIDE

Taking the following precautions into consideration can increase the life span and durability of the machine. Also general maintenance must be employed and the users need to adhere to the recommendation given.

i The pulley must be aligned to ensure long life span of the power transmit ling belt.

ii. All bolts and nuts must be checked, tightened and replace (if necessary) before starting the machine to prevent accident.

iii. The adjusting unit must be greased to reduce the contact friction between the orga shaft and the pushing rod and between pushing rod and the adjusting screw. Thereby by reducing the possible lateral wear.

iv. Good clearing of the machine is necessary to prevent bacterial infections from the grinding foodstuffs.

V. The sealed bearing must be checked and replace (if necessary) in case of failure to ensure longer service year for the orga shaft

CHAPTER FIVE

5.0 MATERIAL SELECTION

Material selection is very important in engineering practice, as it determine ability of the material to withstand stress, life span, physical properties and even the chemical composition of such material to be used.

5.1 Factor Consider When Selecting Materials

1. Economic Cost Advantage:- This factor is very essential in production planning, because the financial implication determines the cost-benefit.

2. Corrosion Resistance:- Material used should be able to resist corrosion, through direct pouring of water or air which also contains certain percentage of moisture in it.

3. Machinability:- Material should be easily formed into the desired shape and size using fabrication process.

4. Durability and Alterability with Frequency of Use:- This is put into consideration to know the strength of material, life span of material and ability to last longer with frequency of use

5. Spectrum of Material Properties:- This is factor that looked into

the physical, mechanical, chemical and dimensional properties of material or to know the quality characteristic or effect on such material.

5.2 Material Used

After all the above listed factors has been put into consideration the materials used are

Mild steel

Cast iron

5.3 Mechanical Properties

1. Strenght:- The materials must posses the ability to withstand sudden force and ability to be beaten into require shape.

2. Mechinability:- Material should be able to machined to required forms and shape.

3. Weldability:- The material should be easy to join together into shape.

Durability:- The material should posses the ability to last longer with frequency of use.

5. Wear Resistance:- The material should be wear resistance as friction is generated during rotation of shaft which causes the material to wear.

5.4 Construction Details and Cost Analysis

Tools Used

1. Lathe machine
2. Drilling machine
3. Grinding machine
4. Guillotine power cutting machine
5. Electric arc welding machine
6. Chisel
7. Hacksaw
8. Hammer
9. Centre punch
10. Scriber
11. Steel rule

12. Measuring tap

13. Vernier caliper

14. Engineering square

15. Compass

5.5 Working Procedures

1. Marking out

2. Cutting of material

3. Maching operating

4. Welding operation

5. Surface finish / grinding

6. Painting

1. Marking Out:- All dimensions provided for working is measure and marked on the plate, the hopper unit is shape gotten using triangulation constructing method.

2. Cutting Operation:- The materials are cut using different cutting tools such as hacksaw and guillotine power cutting machine to cut the material into desired shapes and sizes.

3. Machining Operation: The is the process whereby the diameter of rod used for shaft is reduce to the require dimension using turning operation on the lathe, also it include drilling using radial drilling or other

4. Welding Operation:- This is the process where by various parts are joined together permanently using electrode and electric arc welding machine.

5. Surface Finish:- This is done using grinding machine with grinding disc is used to smooth the welded parts on the machine to achieved a good surface finishing.

6. Painting:- Finally the machine is painted using the required colour, to prevent rusting and grinding food stuffs from been contaminated.

5.6 PRECAUTION TAKEN

1) The workshop is kept clean and non-slip condition and free of obstruction.
2) Using of hand gloves when handling material with sharp corner.
3) Using welding goggle during welding operation
4) Avoid resting on machine while on operation.
5) Wearing safety boot while working to avoid injury that may occur from drop sharp object.
6) Avoid horse play and practical jokes.

5.7 MATERIAL COST ANALYSIS

S/N	TYPES	PRICES IN (₦)
1.	Mild steel sheet metal for hopper and face	2,200.00
2.	Rod for shaft	600.00
3.	Rod for adjusting nut	400.00
4.	Gringing disc	700.00
5.	Belt	400.00
6.	Nut and Bolts	300.00
7.	Pipe for soault	150.00
8.	Electrode(G.12)	200.00
9.	Paint	600.00
10.	1inch rod	200.00
11.	Pully wheel	700.00
12.	Angular	500.00
13.	Flat bar for cover face	600.00
	Total	**N7,550.00**

CHAPTER SIX

RECOMMENDATION AND CONCLUSION

RECOMMENDATION

In view of the problem encountered during the construction of the machine. The flowing recommendation is given to the institute authority to eliminate or reduce the problem encounter for the fourth coming student.

1) Earlier approved of project should be consider to make good research on such project.
2) Government should provide research grant for student, to enable them to use the best material for the project.
3) All machine should be made accessible or available to all student irrespective of the relationship with the technicians in the workshop.
4) All machine should be put in good condition at all time and readily for use.
5) Provide internet facilities for thorough research work.
6) Procure modern equipments in place

CONCLUSION

Project allocation to student for the completion of their National Diploma Certificate program by the school authority is a welcome idea, because it enables the student to practicalized and improve the knowledge acquire in the lecture during the periodic of the course train.

It also enables student to improve in the aspect of handling workshop tools perfectly and operating machines e.g lathe, drilling milling, shaping ect.

The problem of inadequate power supply unavailability of machine tools were faced by most student in the workshop such problem should be eliminated.

Effort of the institute authority is greatly appreciated for implementing project for each student at the end of their course to grant the students the opportunity of expressing or practicalizing their technological skills developed during the cause of the training.

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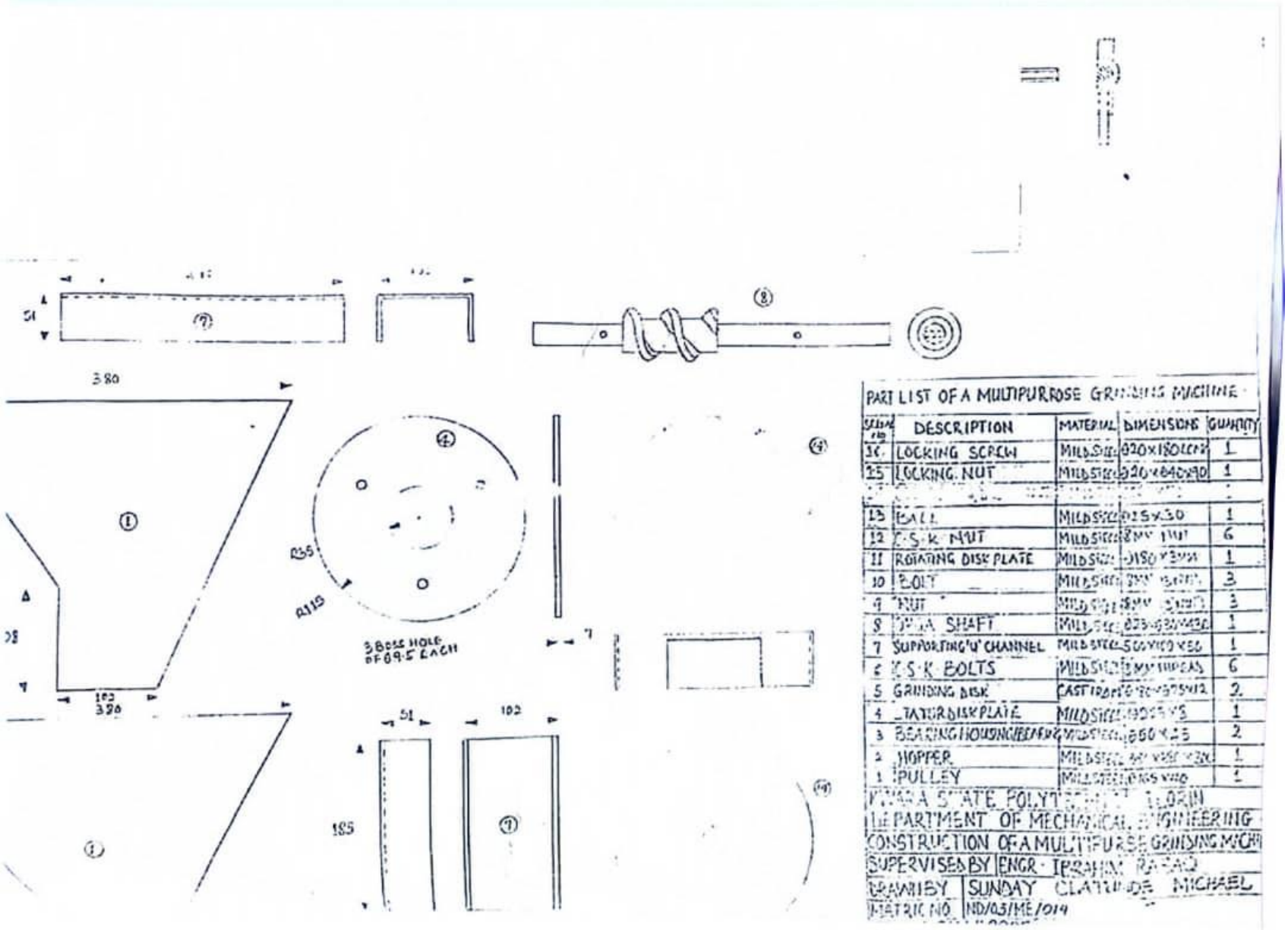
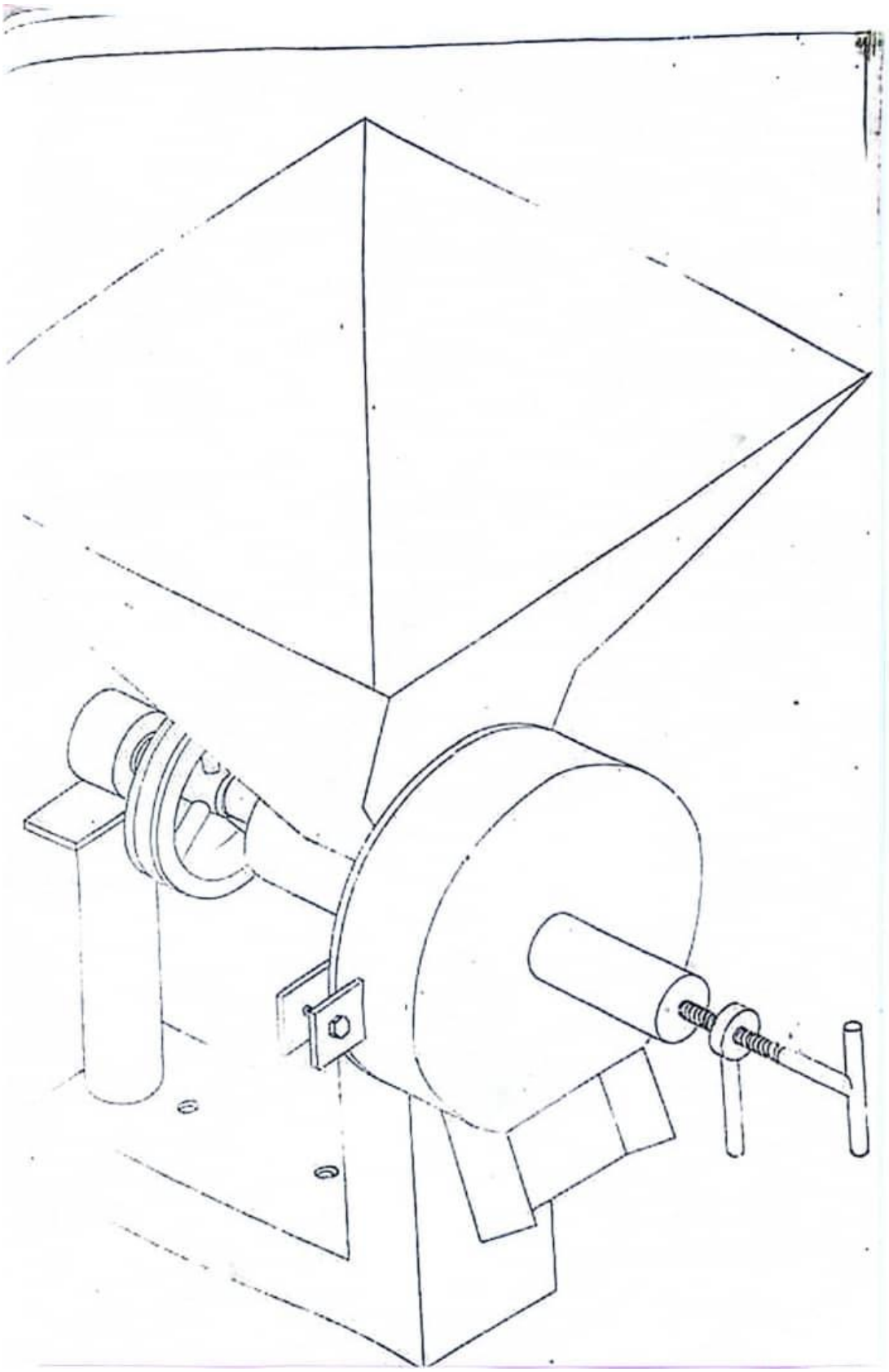
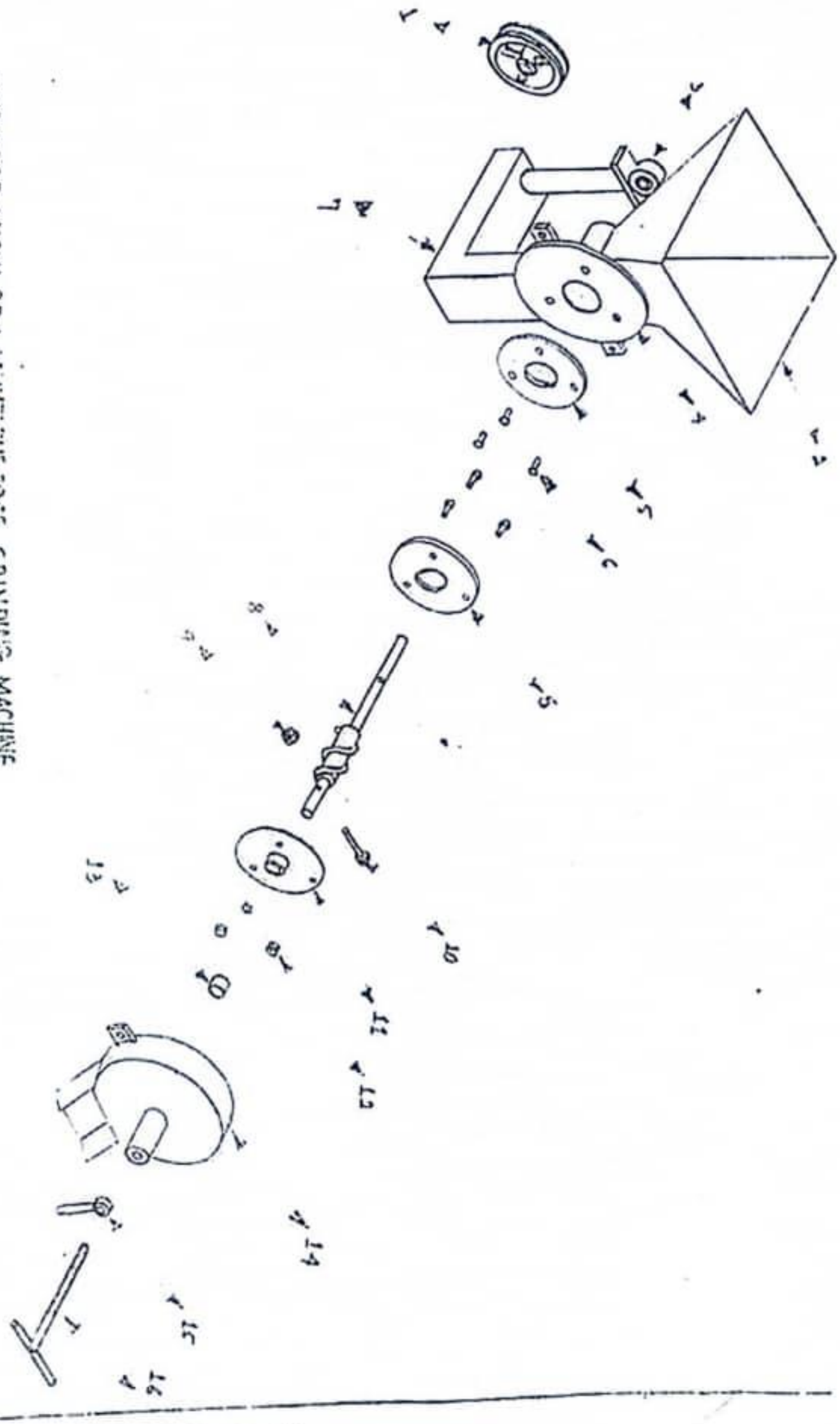

380
51
102
380
185
3 BOSS HOLE OF 89.5 EACH
PART LIST OF A MULTIPURPOSE GRINDING MACHINE
DESCRIPTION
MATERIAL
DIMENSIONS
QUANTITY
LOCKING SCREW
LOCKING NUT
BALL
S.S.K NUT
ROTATING DISK PLATE
BOLT
NUT
SHAFT
SUPPORTING 'U' CHANNEL
S.S.K BOLTS
GRINDING DISK
ROTATOR DISK PLATE
BEARING HOUSING
HOPPER
PULLEY
DEPARTMENT OF MECHANICAL ENGINEERING
CONSTRUCTION OF A MULTIPURPOSE GRINDING MACH
SUPERVISED BY
ENGR. IBRAHIM RASAQ
DRAWN BY
SUNDAY CLAUDE MICHAEL
MATRIC NO
ND/05/ME/014





EXPLODED VIEW OF A MULTIPURPOSE GRINDING MACHINE
SCALE-1:12