DOMESTIC FLOUR MILL

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domestic flour mill

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industrial design centre

Design of Domestic Flour Mill

Diploma project

Submitted in partial fulfilment of the requirements for the postgraduate diploma in industrial design

by

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Approval sheet

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My acknowledgements to

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Contents

1. Introduction

Raw materials often occur in sizes that are too large to the user and, therefore, they must be reduced in size. This size reduction operation can be divided into two major catagories depending upon whether the material is a solid or a liquid. If it is a solid the operations are called grinding and cutting, if it is liquid emulsification or automisation.

Grinding and cutting reduce the size of solid materials by mechanical action, dividing them into smaller particles. Perhaps the most extensive application of grinding in the food industry is in the milling of wheat grains to flour, but it is used on many other occasions, such as in the grinding of corn for manufacture of corn starch, the grinding of sugar and the milling of dried foods.

More than 6000 years ago people ceased to eat grain in its wild state and began to break it up with a rude kind of pestle and mortar. Later a primitive hand mill came into use. This consisted of two stones with roughened surfaces between which the grain was ground. The next mill evolved was the quern, formed of two circular stones, the upper revolving on the lower, to which

it was attached by a metal or wooden pin. The corn was introduced between the stones by means of a funnel in the upper stone which had also a small hole near its edge into which a stick was inserted to serve as a handle. The quern is still used by semi-civilised people, and in remote parts of Ireland, the Hebrides and the Shetlands.

Down to 1874 the grind stone remained the basis of the flour mill, but the power was supplied by animal labour, by wind and by water. Grind stones are still used here and there, for certain types of flour, in the smaller mills. They are made of 'buhr', a very hard silicate. They are from 4 to 6 ft. in diameter, and their surfaces are grooved or furrowed from centre to circumference. The 'hopper' supplies the grain through the centre of the upper stone; the wheat is pushed along the grooves and broken upon the ridges.

Modern method :

In modern flour mills, chilled iron rollers have taken the place of grind stones. The first successful steam mill was erected in London in 1784, and iron rollers were first used in 1840, following their introduction in Budapest. Hungary became the world centre for flour mills on account of this improvement. Minneapolis

soon adopted it, becoming the most important flour mill centre in the world, she remains one of the most important centres today. From 1880 the system of roller milling has been in operation in all large mills. As a source of motive power, steam has largely been replaced by electricity.

Domestic flour mill is a smaller version of the commercial flour mill. The traditional pair of stone wheels is driven by an electric motor. The other main parts of the mill are the hopper and the drawer for collecting the flour. It has been found out that mostly housewives operate the flour mill and as it is, no ergonomical factors have been considered in the present design. It is also felt necessary to increase the aesthetic value, reduce the cost and make its operation easier so that its services could be extended to a larger number of people.

2. Problem Statement

Design of Domestic Flour Mill

3. Information

Information has been collected from the following catagories :

3.1 Manufacturer

3.2 Distributor and seller

3.3 Maker of the stone wheels

3.4 User

3.5 Existing flour mills

3.1 Manufacturer

3.1.1

Manufacturing of domestic flour machines is a side business of every manufacturer. The reason being its low demand.

3.1.2

The monthly production rate is about 15 to 20 machines depending upon the order.

3.1.3

The orders are usually booked by the seller or distributor. Delivery is usually within a fortnight.

3.1.4

As it is a side business, the manufacturer has not paid much attention towards any further development.

3.1.5

The costly parts are the motor and the sun-mica outer cabinet.

3.1.6

Formerly the machine was available in steel housing model as well as sun-mica deluxe model. But as the steel housing model was found unpopular, the manufacturing of the same has been stopped.

3.1.7

Plastic material has not been considered so far as they do not find any drawback with the existing materials. Also the manufacturer has not thought of plastic material.

3.1.8

Most of the work is done by fabrication as it is easier and the manufacturer has a welding set which he is using for the entire plant.

3.1.9

As the rate of production and demand is quite low, batch production is followed.

3.1.10

Chipping of the stone wheels should be done once a year. Cleaning and oiling should be done every month and 10 rupees are charged for the same.

3.1.11

The cost of a pair of stone wheels is 80 rupees.

3.1.12

As the entire machine is of simple construction and also as it does not involve any complicated mechanism, the complaints regarding the working of the machine are rare. However, the usual complaints are connected with the motor.

3.1.13

As each and every part is manufactured in batch production, spare parts can be had by placing an order.

3.1.14

Three different qualities of flour can be obtained from the machine - fine, rough and medium. The necessary adjustment is done by a knob provided on the top.

3.2 Distributor and Seller

3.2.1

The distributor is having a departmental store where other kitchen equipments can also be purchased. Usually such stores are situated at a central place.

3.2.2

The customers are usually of high income group having an income of more than 2000 rupees per month.

3.2.3

The cost of the domestic flour mill is a governing factor and reduction in cost will certainly increase the sale of the flour mill.

3.2.4

After receiving the order, the distributor informs the manufacturer and gets the mill and finally supplies to the customer.

3.2.5

Sometimes complaints are received. A mechanic will be sent to attend the complaint otherwise the manufacturer will be informed about the complaint.

3.3 Maker of stone wheels

3.3.1

Usually he belongs to a backward class and making articles of stone is his family work.

3.3.2

He gets the original stones at 0.60 paise per piece. Then the entire work is done by chipping only. Usually he starts work at 7.00 in the morning and by 6.00 in the evening he completes two pairs of stone wheels. Sometimes he carves some design on the upper wheel to increase its aesthetic value.

3.3.3

The final product is sold to house-holders at a rate of 12 rupees a pair. He has to struggle hard even for selling the finished product as he has to go to every house.

3.3.4

He said that he would be happy to supply the chipped stone wheels to the manufacturers of domestic flour mills which will reduce lot of his work.

3.4 User

Here again two catagories have been made which are as under :

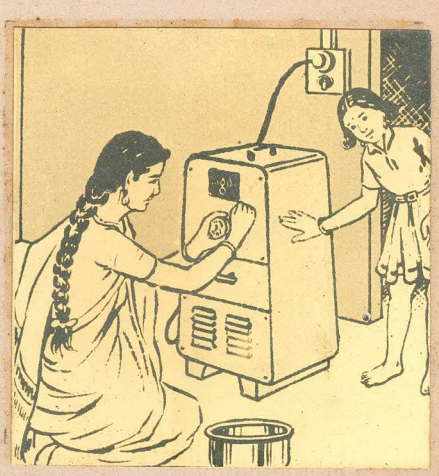
3.4.1 People using domestic flour mill

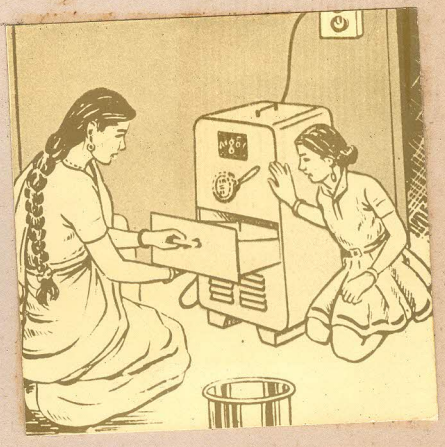
3.4.2 People not using domestic flour mill

3.4.1

People using domestic flour mill

- Usually they belong to a high income group having an income of more than 2000 rupees per month.
- They have full time servants to look after kitchen requirements. Apart from this they do some other work also.
- They are quite happy with the mill because they can get grains ground at any time and also for a required quality.
- However, they feel the cost of the existing machine to be very high, because the investment is more and corresponding returns are very low.
- Some persons are using flour mills for last twenty years. In the older mills collection of flour is open to the environment and the user feels that it should be enclosed to protect the flour from dust particles.





- Sieving has to be done, which is a laborious process. Sometimes servants do not sieve the flour which finally affects the quality of the food.
- Sometimes persons staying in the same building do come with the grains for getting them ground. This fact puts the owner of the machine into trouble.
- Better and easy availability of spare parts should be there. It is the experience of the customers that spare parts are not readily available and also they have to pay more for the same.
- Some machines cannot be cleaned easily and properly because of their constructional complexity.

3.4.2

People not using domestic flour mill

- A family of five members requires about 30 kgs. of different grains. The amount of wheat being the maximum.
- Usually the grains are ground weekly or fortnightly, and sometimes, as and when required.

- About one week's requirement is kept as a stock for emergency purposes.
- Some families send the grains to the mill through a temporarily employed boy or sometimes women.

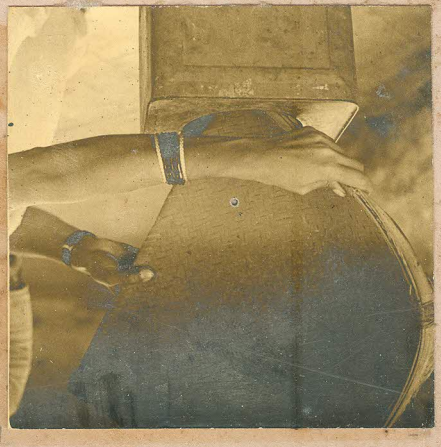
- Usually one has to wait for about half an hour for his turn and one spends this time in chit-chatting with others.

- Sometimes people keep the bags containing grains in the mill while going to the office in the morning and collect the flour in the evening while returning to the house.

- Usually nobody feels shy of going to the mill as one is quite interested in the house work.
- They have complaints regarding the quality of the flour, but they are rare. However, sieving is necessary which is done while using the flour.

- Usually nobody measures the quantity of the flour as they have fixed bags or tin boxes for flour because of which they get an approximate idea of the quantity.
- For smaller work they use the traditional method. However, use of this method has limited scope because of its manual labour.
- It is bit difficult to carry all the accessories to a central place and start the work of grinding the grains.

- While grinding the grains with the traditional method children do come and disturb thereby making the work more laborious.
- They feel like having a domestic flour mill but its high cost prevents them from purchasing it.
- Those belonging to higher income group have full time servants and they feel that the servant, not being literate, may mishandle the equipment.



3.5 Existing Flour Mills

The following is the brief description of the different existing flour mills.

3.5.1

Hinka grinding mill

- Manufactured by M/s. Ramesh Industries
- Grinding capacity is 6 kg. per hour
- Height - 30"
- Width - 12½"
- Breadth - 18"
- Weight - 68 kgs.
- Motor - 1/2 h.p., 230 volts
- Electric consumption is half unit per hour
- Outer casing is of sunmica
- Guarantee of 12 months is given
- Price - Rs.1550/-
- Capacity of the hopper is one kilogram

3.5.2

Nigo's household grinding mill

- Manufactured by Nigo's Corporation
- Grinding capacity - 5 to 6 kgs. per hour
- Height - 30"
- Length - 15"
- Breadth - 15"

- Motor - 1/2 h.p. single phase
- Electric consumption - 1/2 unit per hour
- Outer casing is of sheet metal
- Price - Rs.1450/-
- Colour - dark green
- The grinding wheels rotate in the vertical plane.
- Graphics - on the top of the front surface

3.5.3

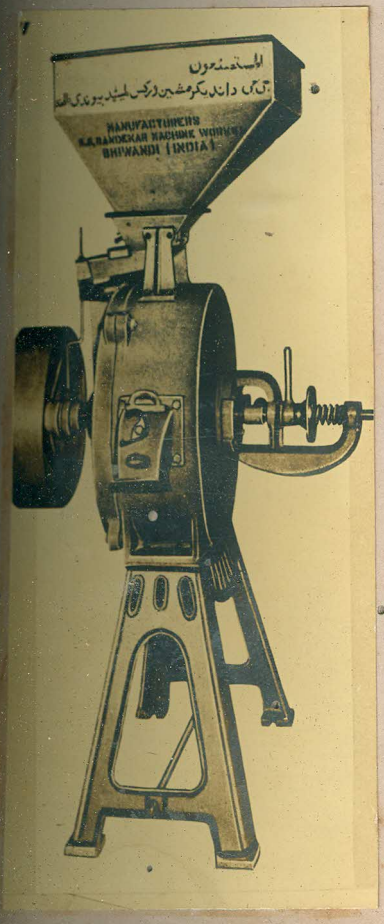
Manufactured by Sayaji Engg. Works

- Grinding capacity - 10 kg. per hour
- Height - 36"
- Breadth - 24"
- Width - 18"
- Motor - 1/2 h.p. single phase
- Electric consumption - 1/3 unit per hour
- Outer cabinet of sunmica
- Price - 1900 rupees
- Capacity of the hopper - 10 kgs.
- In this case upper wheel is rotating

3.5.4

Manufactured by Swastik Engg. Works

- Grinding capacity - 4 kgs. per hour
- Height - 30"
- Breadth - 24"
- Width - 18"
- Motor - 1/2 h.p. single phase
- Outer cabinet of sunmica
- Price - Rs.1800/-
- Capacity of the hopper - 6 kgs.
- Colour - light green
- Graphics - at the top right side corner of the front surface.



3.5.5

Commercial flour mill

- Manufactured by Dandekar Machine Works
- Grinding capacity - 300 kgs. per hour
- Height - 5'-0"
- Length - 3'-6"
- Width - 2'-6"
- Motor - 10 h.p.
- Price - Rs.900/- (exclusive of motor cost and taxes)
- Diameter of stone - 20"
- Net weight - 280 kgs.
- Graphics on the hopper is written in English and local language.

4. Analysis

4.1 Structural Analysis

4.1.1 Hopper

This is made up of M.S. sheet, which is pressed to the required shape. It is square at the top and has a hole in the centre at the bottom. Welding is done to connect bottom plate to the main body.

4.1.2 Stone wheels

These are emery stones of round shape. The round shape is given by chipping operation. The surface of the wheel is rough. The upper wheel has a hole in the centre for allowing the grains. The bottom rotating wheel has also a hole in the centre where shaft can be accommodated.

4.1.3 Pulley (Larger)

This is of cast iron and has a groove on the rim to accommodate the belt. It has a hole in the centre.

4.1.4 Pulley (Smaller)

This is similar to the above except it is smaller in diameter.

4.1.5 Drawer

This is rectangular in shape. This is made up of wood and sunmica sheet has been pasted on it.

4.1.6 Adjusting lever

This has one M.S. rod which is turned and drilled. One plate of M.S. which is also drilled.

4.1.7 Cover of the wheels

This is round in shape made out of M.S. sheet. Welding has been used to join the parts. The top stationery wheel is fitted to this cover, and the hopper is placed on this cover and is fitted by screws. This cover looks like a cylinder.

4.1.8 Main frame

This is made up of M.S. flat which are bend to the required size and then welded to form a structure. A plate is also welded to the main frame. This plate has drilled holes.

4.1.9 Spring

This is of spring steel.

4.1.10 Adjusting knob

This is of round shape having slots on its rim. This is of cast iron.

4.1.11 Indicator scale

This is of Al-plate with numbers marked on it.

4.1.12 Guide ways for cover

These are of M.S. rod of 1/2" diameter. These have been bent as shown in the figure. At the two ends of the rods metalic plates have been joined by welding.

4.1.13 Top cover

This is made out of M.S. flat about 1/4" thick. All four sides have been filed and are made roughly straight. At the centre, a circular slot is made by turning and a hole is drilled at the centre and it is bored. The cover is of rectangular shape.

4.1.14 Outer body

This is rectangular in shape. It is of plywood on which sunmica sheet is pasted.

4.1.15 Motor

It has a cast iron body and a base plate. Base plate has four holes. Smaller pulley is mounted on the shaft of the motor.

4.2 Functional Analysis

4.2.1 Hopper

The purpose of this is to accommodate grains and have a control over the flow of the grains.

4.2.2 Stone wheels

These are used to grind the grains which are coming in between the wheels.

4.2.3 Set of pulleys

This is used to reduce the speed of rotation from 1440 r.p.m. to 400 r.p.m.

4.2.4 Drawer

This is used to collect the flour.

4.2.5 Cover for the wheels

This has got following different purposes :

- It serves as a support to the hopper
- It holds the upper stationery wheel
- It protects the two wheels from dust and other unwanted materials.
- It also protects the flour from dust

4.2.6 Main frame

This serves as -

- a support to the motor, wheels, bracket and other parts.
- also as a skeleton to the sunmica body.

4.2.7 Adjusting lever

This works on the principle of leverage. With the help of this the gap between the two emery stones is adjusted. There is a supporting element which acts as a pivot point.

4.2.8 Adjusting knob

This is fixed to the adjusting lever. The rotation of this knob helps in the movement of the bottom emery stone wheel.

4.2.9 Guide ways for cover

The function of these two guide ways is to guide the movement of the cover. These also serve as a guide while covering the stone wheels with the cover.

4.3 Formal Analysis

4.3.1

The outside appearance is quite good because of the extensive use of sunmica.

4.3.2

Sharp corners on the body are having a bad visual effect.

4.3.3

It does not seem to be a flour machine because the drawer and the knob create an effect that it is a cupboard.

4.3.4

When the upper lid is opened, we see the hopper and other parts of the flour machine which reduces the sophisticated appearance of the machine. The colour and sharp edges of the individual parts do not add to the aesthetic appearance.

4.4 Ergonomical Analysis

4.4.1

The sharp corners are bound to trouble the user. In particular they may affect children.

4.4.2

The drawer for collecting the flour is quite at the bottom, and for that, one has to bend sufficiently down.

4.4.3

The capacity of the hopper is about one kg. which is quite less and the person using it will have to keep an eye on the hopper often and often which may not allow him to do any other work.

4.4.4

The switch is outside the cabinet and it is placed at a sufficiently low height. So it is quite likely that children may put it on unknowingly. Though it is not going to be a harmful deed, but still one has to be cautious about it.

4.4.5

Sieving has to be done separately as there is no sieving attachment. This is a time taking and troublesome process. This cannot be avoided because unsieved flour may affect the quality of the food.

4.4.6

There is no 'on-off' indication on the switch.

4.4.7

The handle of the drawer has sharp edges and there is no sufficient gap to keep the fingers for pulling the drawer.

5. Hypothesis

5.1 Structural

5.1.1

The structure should be strong enough to take up a total load of about 25 kgs. including the weight of the grains.

5.1.2

Standard size material should be used.

5.1.3

It should be made up of non-toxic materials like polystyrene, nylon and polyethylene which will withstand normal wear and tear and be thoroughly cleanable.

5.1.4

The method of joining two parts should be simple so that it can be done in a small scale industry.

5.1.5

The process of making individual parts should be simple and be within the reach of a small scale industry.

5.1.6

The variety of materials to be used should be minimum to reduce the storage and also unnecessary investment.

5.1.7

The material and process cost should be minimum from the manufacturer's point of view.

5.2 Functional

5.2.1

The container which can accommodate about 5 kgs. of grains is essential, as a family of about five members requires about 5 kgs. of grains per week.

5.2.2

It should be possible to get flour of different qualities. This results in a mechanism by which the gap between the two grinding surfaces can be adjusted.

5.2.3

A container for collecting the flour is essential.

5.2.4

It is desirable to have a sieving attachment with the machine because most of the people do not like to do it manually.

5.3 Formal

5.3.1

The flour machine should be attractive in design, appearance and workmanship.

5.3.2

Sharp edges and corners should be avoided.

5.3.3

Colour should be pleasing and should go with the environment.

5.3.4

Parts like screws and nuts should not be protruding outside.

5.3.5

The mill should be compact.

5.4 Ergonomical

5.4.1

In the present case the two operations, pouring the grains and pulling out the drawer, are done in two different postures. So, it is necessary that the new equipment should be such that both operations are done in one posture.

5.4.2

Moving parts like belts should be completely enclosed.

5.4.3

Wiring should not be open or liable to wearing or fraying.

5.4.4

Fabricated equipment should be so constructed that there are no sharp edges that can catch, cut or tear.

5.4.5

All control units should be clearly seen and be within the reach of the operator. As far as possible the control knobs should be of different shapes to avoid confusion as the workers will be uneducated.

5.4.6

Proper marking should be there on the knob. In case a scale is required, it should be in a easily readable condition.

5.5 Economical

5.5.1

It is necessary that the mill could be operated both by hand and by motor.

5.5.2

The cost of the hand operated mill should not exceed Rs.400/-.

5.5.3

The cost of the motor operated mill should not exceed Rs.1000/-.

5.5.4

It should be possible to extend the use of motor for other kitchen equipment.

6. SYNTHESIS

6.1

The capacity of the hopper has been decided to be about two kgs which is the bi-weekly requirement of a nominal family. The hopper can be made up of either M.S. sheet or plastics or aluminium.

6.2

The grinding wheels will be of natural white stone. They will be round in shape. There is no problem of rusting in case of stone and also it can be reused by mere chipping which is quite cheap and easy process.

6.3

A channel will be mounted around the bottom wheel, so that flour will be collected in the channel. This can be either of plastics or of sheet metal.

6.4

The speed reduction will be done by using a set of pulleys of cast iron in case of motor operated unit. There will be a v-groove on the circumference of the pulleys.

6.5

A mechanism will be used to control the feed of grains to the wheel.

6.6

A box will be kept for collecting the flour. This box will be easily removable. This box will be either of plastic or sheet metal.

6.7

The entire system will be supported on a M.S. shaft and a foot step bearing. The bearing will be mounted on a cast iron frame.

6.8

The entire system will be enclosed in a box. The box will be either of sheet metal or of fibre glass or of wood. The box will have a lid and also an opening in the lower portion for keeping the flour collecting box.

6.9

It is necessary to design the hand operated and motor operated units on a system basis. So, the basic grinding unit will be same in both the cases. In case of motor driven unit the extra parts will be a motor, a speed reduction unit and an external cover.

6.10

The traditional hand operated unit will be provided with certain attachments so that the work will be faster and easier. It is also considered to provide the additional attachments within just twentyfive rupees.

6.11

The colour will be pleasant and will go with the kitchen environment.

6.12

The height of the motor operated unit is fixed taking into consideration the possibility of its use both by keeping it on the ground as well as on the table or stand.

6.13

The form of the motor operated unit will be rectangular so that it matches with the kitchen equipments like refrigerator, cooking range, etc.

7. DESIGN DEVELOPMENT

Two solutions have been developed. One is the hand operated mill and the other is motor operated.

7.1 Hand operated unit

- This is same as the traditional unit. In this case the upper wheel will be rotating and the bottom wheel will be stationary. The wheels are of natural white stone.

- A polystyrene hopper is fitted to the top wheel. The hopper and the flour collecting channel have been vacuum formed in one set, and then the channel part is cut out. This reduces the material and processing cost to a considerable extent. The hopper is round in shape. It has five holes in the central slot, two for fixing, two for guiding the grains and one for central pivot.

- A rubber strip is fitted to the top wheel and rotates along with the top wheel. The rubber strip pushes the flour in the channel to the rectangular hole. This rubber strip can be replaced very easily.

- A polystyrene channel is fitted to the bottom wheel. This is vacuum formed along with the hopper. The flour will fall in the channel. The channel has a rectangular hole through which the flour comes out and falls in the pot.

- The two grinding wheels have been kept on a stand of wooden planks. Two wooden planks have been joined so that they form a cross and a step is made on the upper edge so that the bottom wheel does not slip out. The height of the wooden plank is five inches. This height is sufficient for convenient operation in sitting position.

- A polystyrene plate having two holes is mounted on the central pivot which is stationary. This plate guides the grains to the grinding wheels.

- A permanentally fixed handle avoids lot of work of the house wife. This handle is strong and sturdy.

- A grip is fitted on the top of the handle. This grip helps in faster and easier operation. This also avoids the trouble that a house wife faces due to the fibres coming out of the handle.

- Sufficient space has been provided between the two wooden planks to accommodate the pot or vessel.

- The entire unit is sufficiently light and can be assembled very easily. So, it can be taken to any place in the house and can be used.

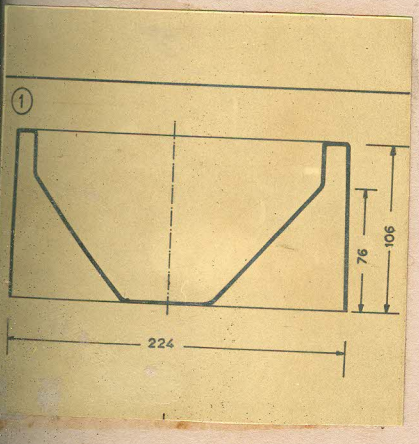
- All the individual parts like hopper, channel and wheels are of round shape. So, they form one unit.

- All the parts have been given sufficient radius so that they do not harm the operator and also children. The round edges increase the visual appearance of the product.

- All the additional attachments can be supplied within just twentyfive rupees which is within the reach of the people belonging to the low income group.

7.2 Motor operated unit

- In this case the bottom wheel is rotating and the top wheel is stationary. The wheels are of natural stone and are round in shape. The bottom wheel has a larger hole in the centre to accommodate main spindle and bush.



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- The flour collecting channel which is vacuum formed along with hopper is fitted to the body by means of four plastic clips. The channel is all around the bottom wheel. It has a rectangular hole which is the way for the flour to go to the sieve.

- A rubber strip is fitted to the bottom wheel and rotates along with the bottom wheel. The rubber strip pushes the flour to the rectangular hole. This rubber strip can be replaced very easily.

- A sieving attachment is also provided which saves lot of trouble. The sliding motion to the sieve is given through a cam. The sieve is placed in a frame of M.S. flat. The cam is mounted on the main shaft. Two springs have been mounted on the other side of the M.S. flat frame. So, the flour will be collected in the vessel only after it is sieved. The sieve can be taken out very easily for cleaning purposes.

- A polystyrene box of rectangular shape is placed at the bottom where the flour is collected. The box is made by vacuum forming process and can be fitted in the main body easily by just sliding.

- A set of cast iron pulleys helps in reducing the speed of the motor to a required speed. A v-belt has been used for transmitting the motion.

- A polystyrene circular plate having two holes is mounted on the central pivot. Here the central pivot is rotating along with bottom wheel. This plate helps in controlling as well as guiding the grains to the grinding wheel.

- Two levers are fitted to the top wheel by means of which the top wheel can be very easily lifted up for cleaning.

- The main spindle is supported on a foot step bearing. The bearing is fixed to a cast iron base plate. The motor is also mounted on the same base plate. The base plate is machined for getting a plane surface. Sufficient slots have been provided to reduce the weight of the base plate.

- Four M.S. angles have been fixed to the base plate. These extend upto the top of the machine. Two plates having a hole in the centre have been welded to the angles for supporting the top wheel. The angles also support the outside M.S. cover.

- The entire system is enclosed in a box made up of sheet metal of twenty s.w.g. There are totally four sheet metal parts. These are bent and drilled. These are supported against the four angles. The sheet metal body works out to be cheaper and easier to process when compared with wood and fibre glass.

- A lid is attached at the top of the sheet metal body. The lid can be easily removed or can be kept open while pouring grains.

- The sheet metal cover is first pretreated and then spray painted by air drying paint. Becuase of the pretreatment, the colour remains in a good condition for a period of about eight years. The cost of the spray painting with pretreatment is about ten rupees per square metre, which is quite worthy compared to the life of the paint.

- The different sheet metal parts can be very easily assembled as well as dissembled because only nuts and bolts have been used for assembling them.

- The cover for the motor is also fixed by screws and can taken out very easily while repairing the motor and while cleaning. It has slots along its surface for cooling purpose.

- A screen between the flour collecting box and the shaft avoids the person from seeing the oily and dirty mechanical parts. So, when the flour collecting box is taken out, only the screen is seen.

- Easily removable upper wheel. This makes the cleaning very easy. The wheel has two levers with which it can be very easily lifted up.

- The total height of the machine is about 16 inches. This is convenient for both floor and table use.

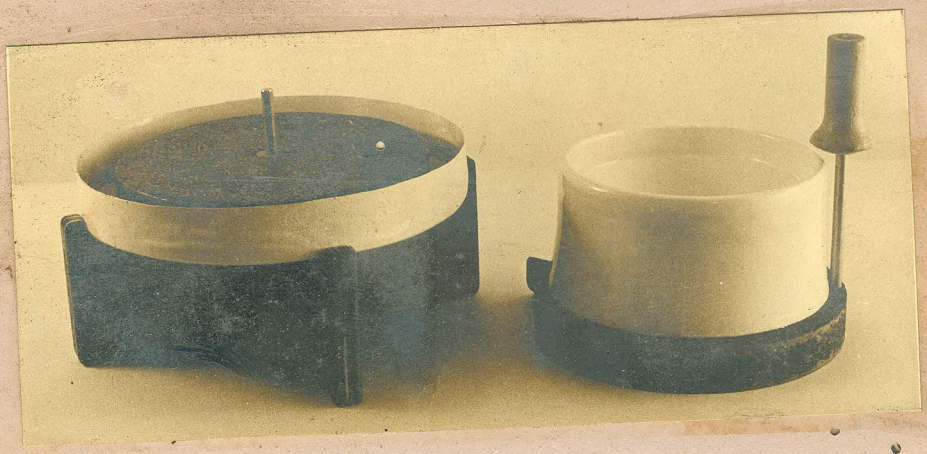
- Pulley drive gives a smooth and noise free performance.

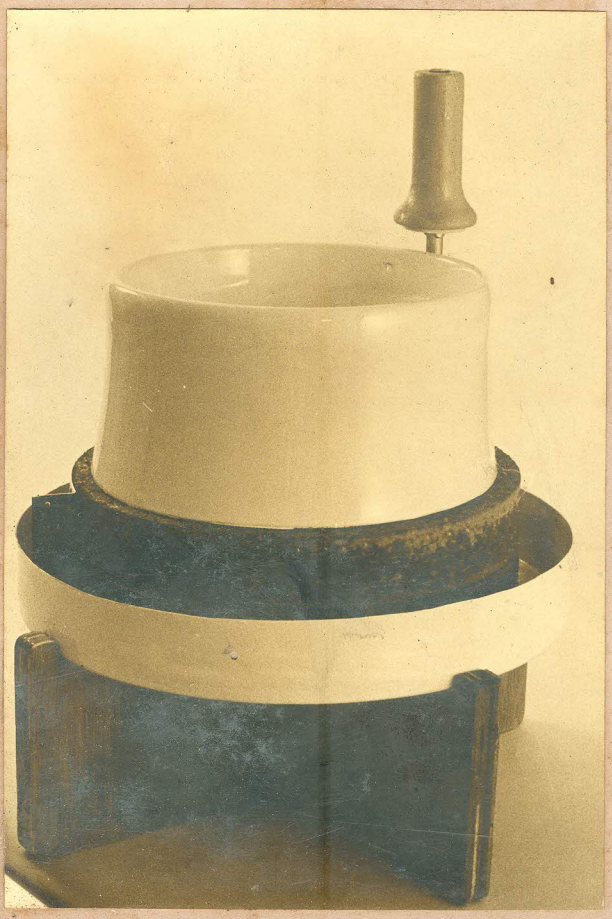
- The colour is pleasing and suits the environment. The rectangular shape also goes with the environment.

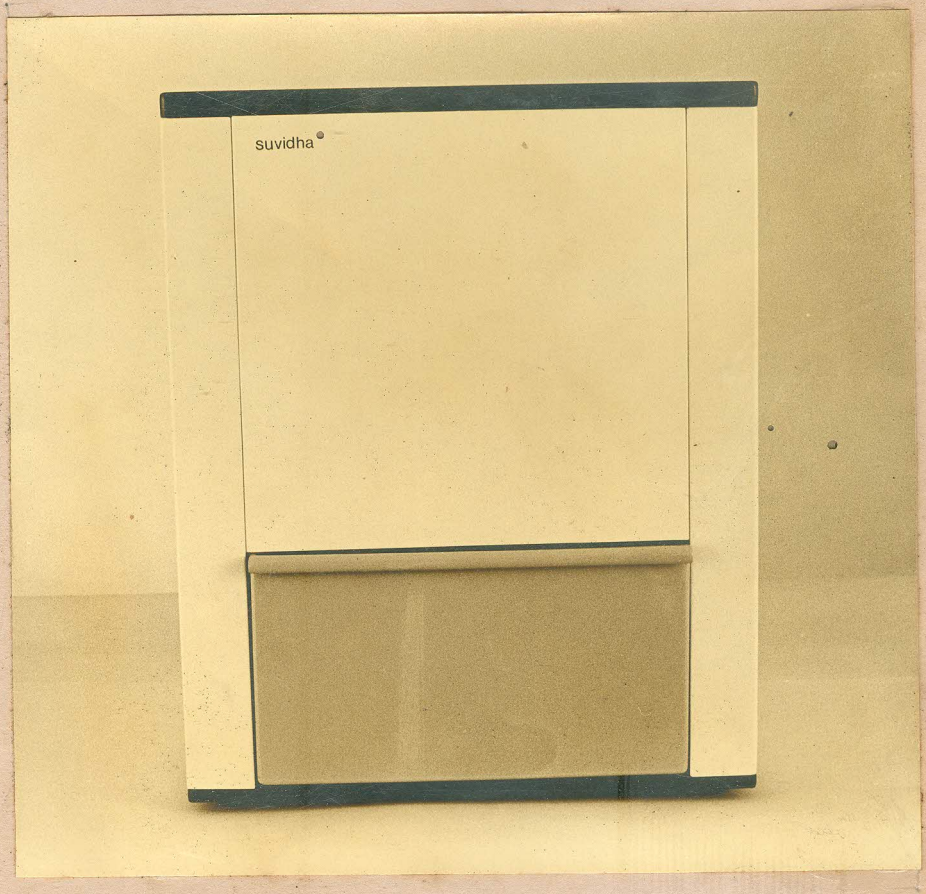
8. Communication

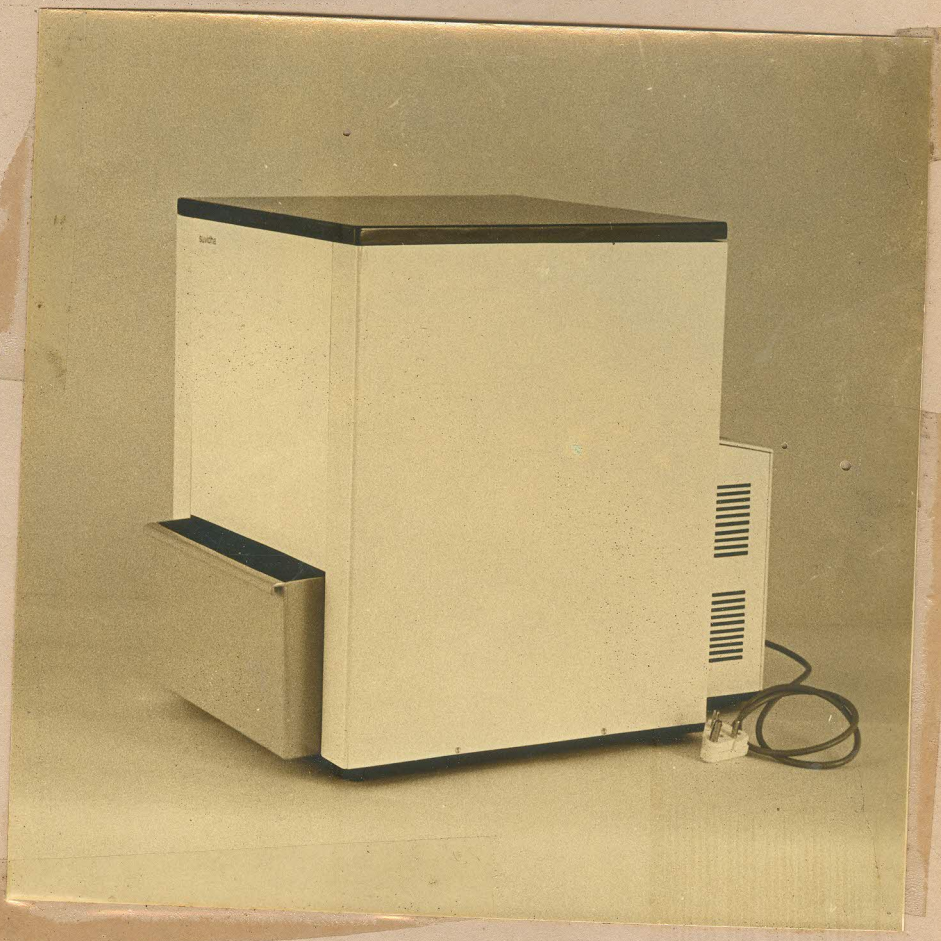
8.1 Photographs

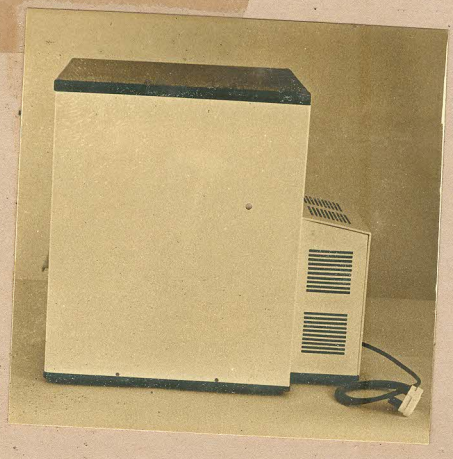
8.2 Technical drawings

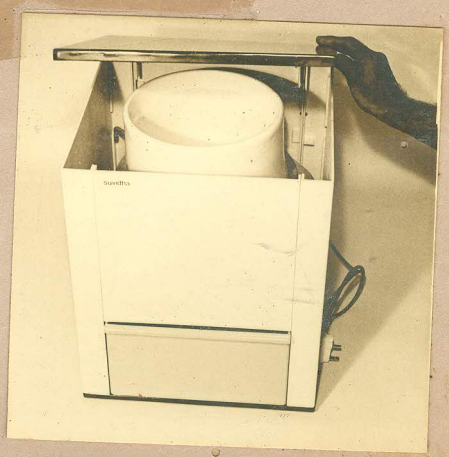


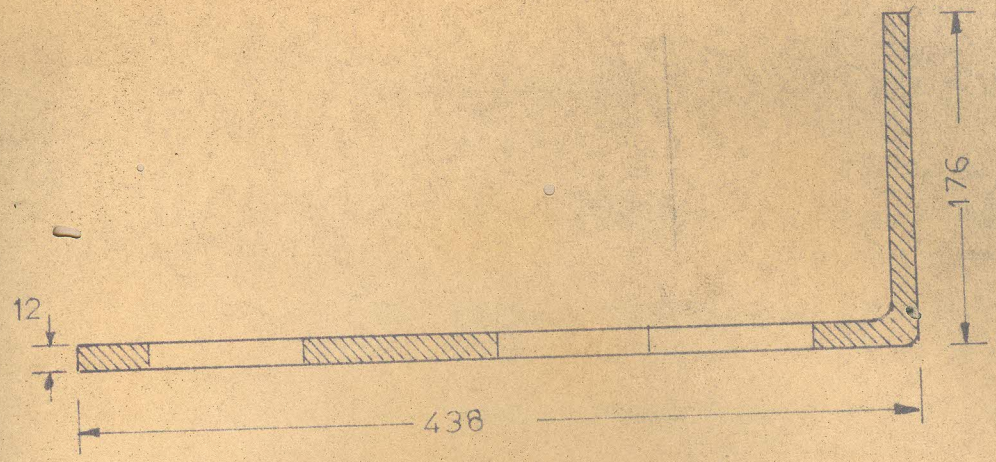


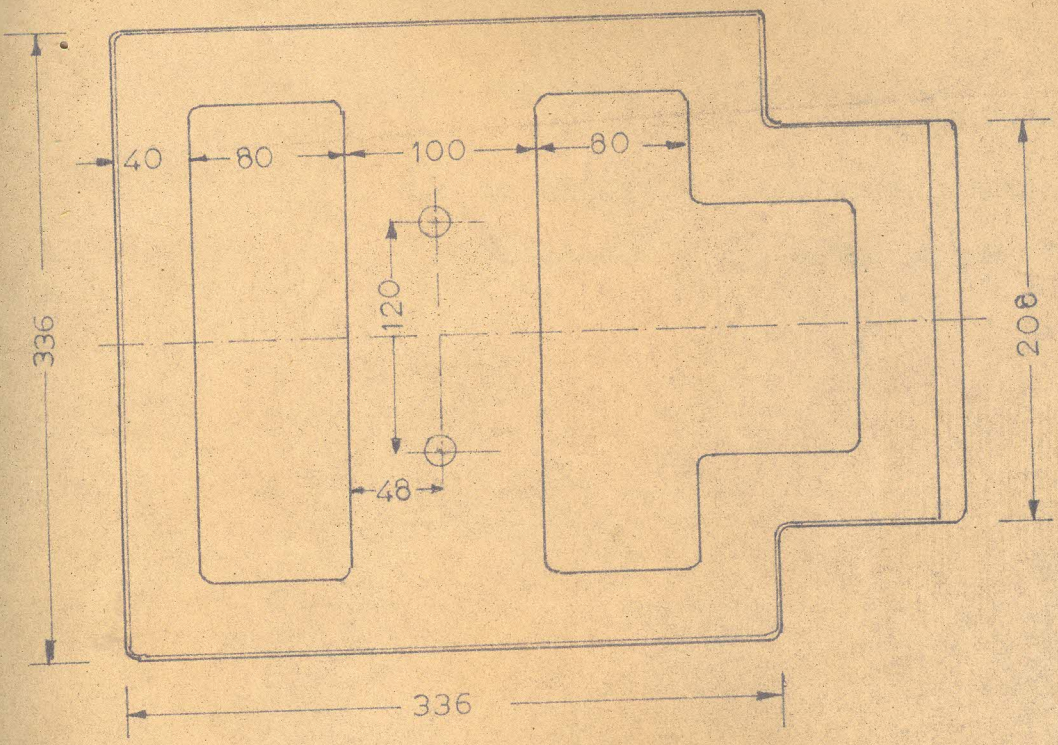












2 15ϕ HOLES

33	BASE PLATE	CAST IRON	ONE	CASTING
NO	DESCRIPTION	MATERIAL	NO OFF	FINISH

DIPLOMA PROJECT DOMESTIC FLOUR MILL

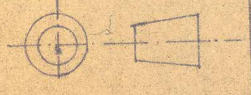
PARTS DETAIL

S.B BIDRE THIRD BATCH

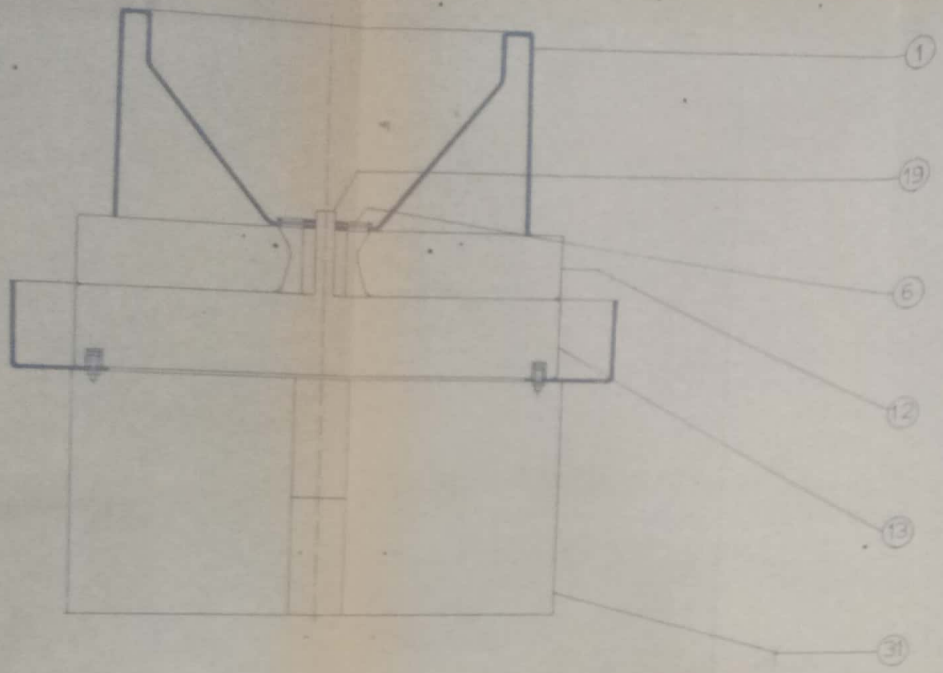
1971 1973

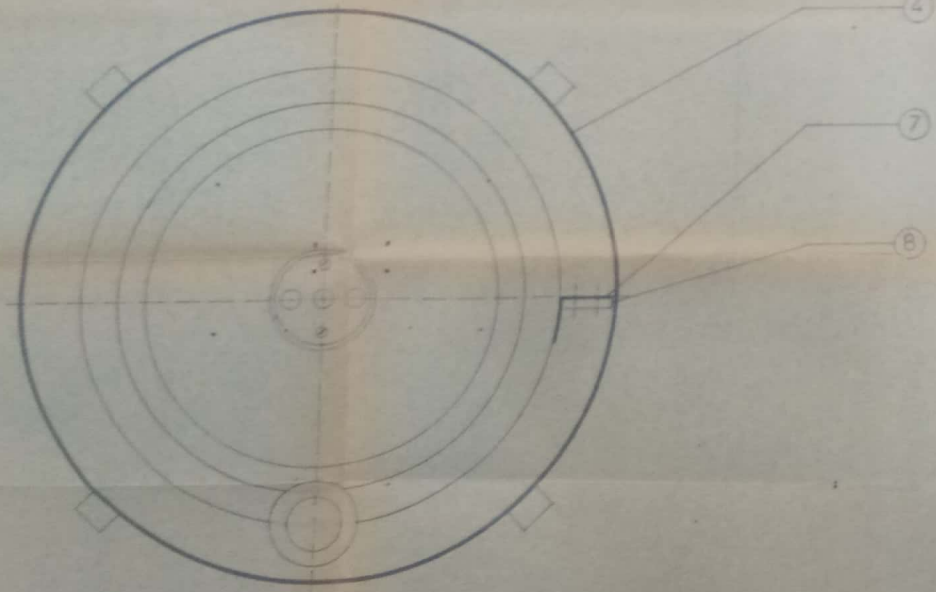
ALL DIMENSIONS IN MM

SCALE QUARTER FULL SIZE



INDUSTRIAL DESIGN CENTRE I.I.T. BOMBAY 76





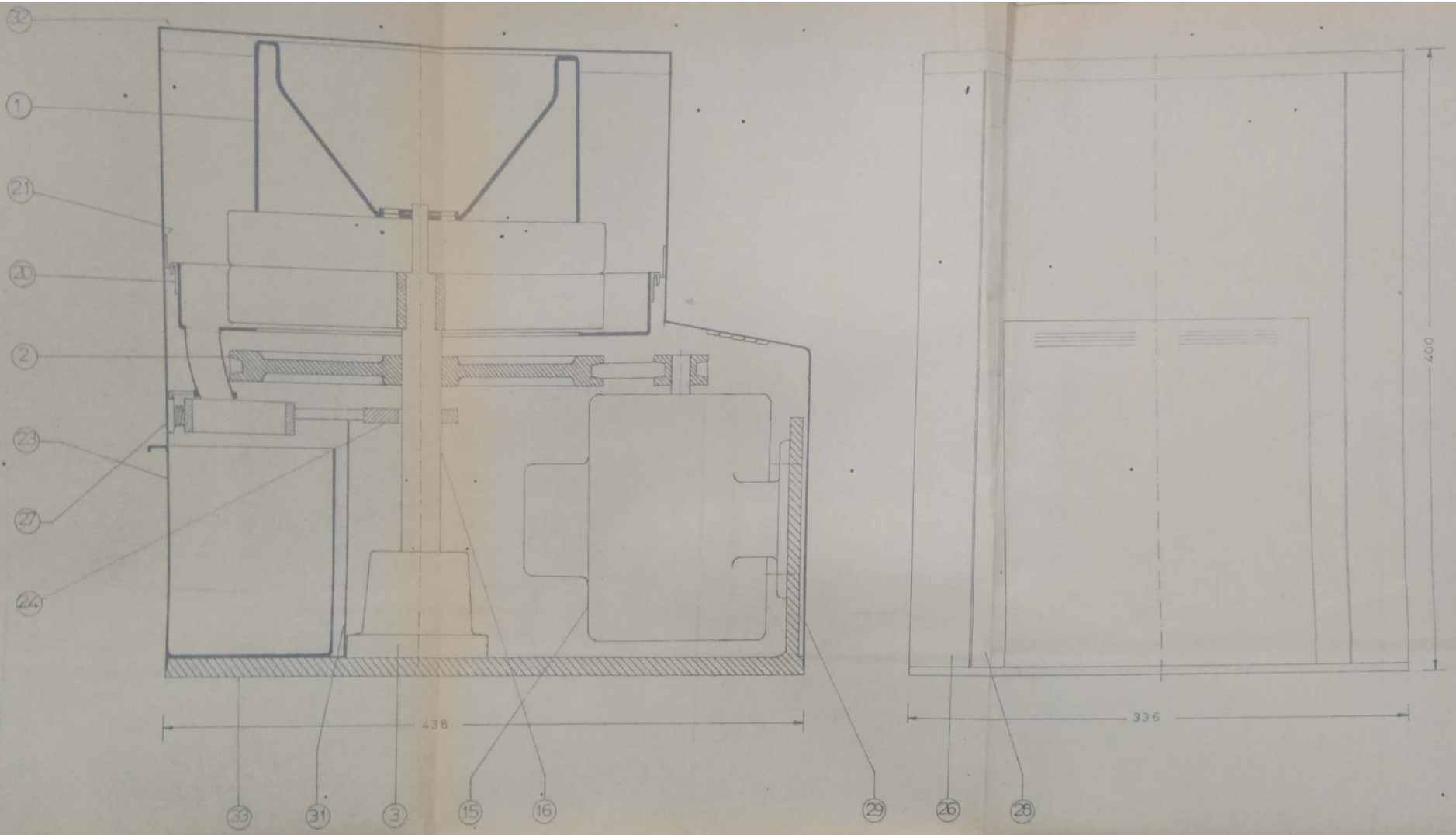
DIPLOMA PROJECT DOMESTIC FLOUR MILL

ASSEMBLY OF HAND OPERATED UNIT

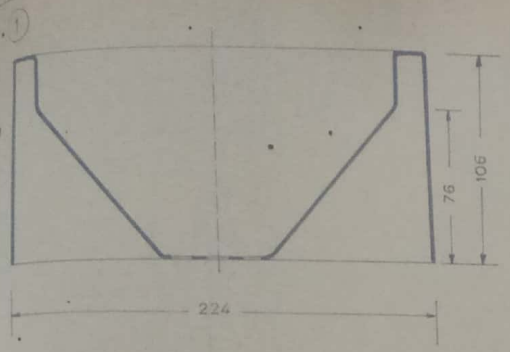
ALL DIMENSIONS IN MM

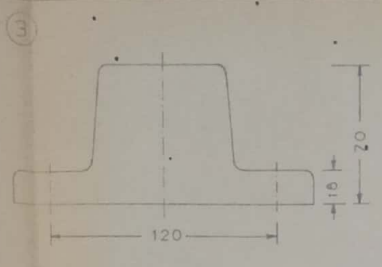
SCALE HALF FULL SIZE

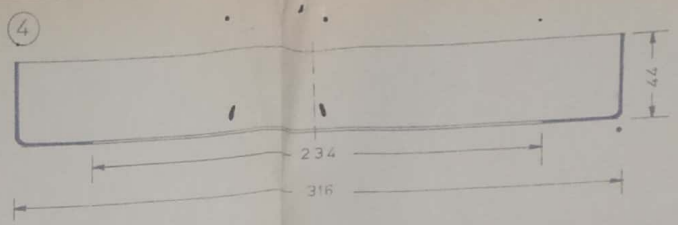
INDUSTRIAL DESIGN CENTRE I I T BOMBAY 76

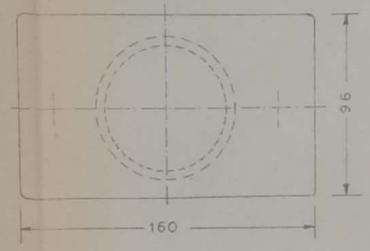


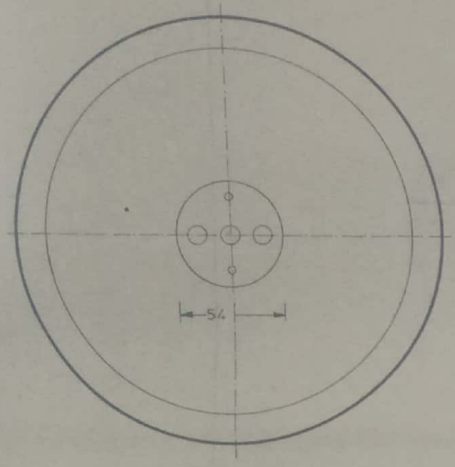
DIPLOMA PROJECT DOMESTIC FLOUR MILL		
ASSEMBLY OF MOTOR OPERATED UNIT	S B BIDRE 1971 1973	THIRD BATCH
ALL DIMENSIONS IN MM SCALE HALF FULL SIZE		
INDUSTRIAL DESIGN CENTRE I.I.T. BOMBAY -.76		

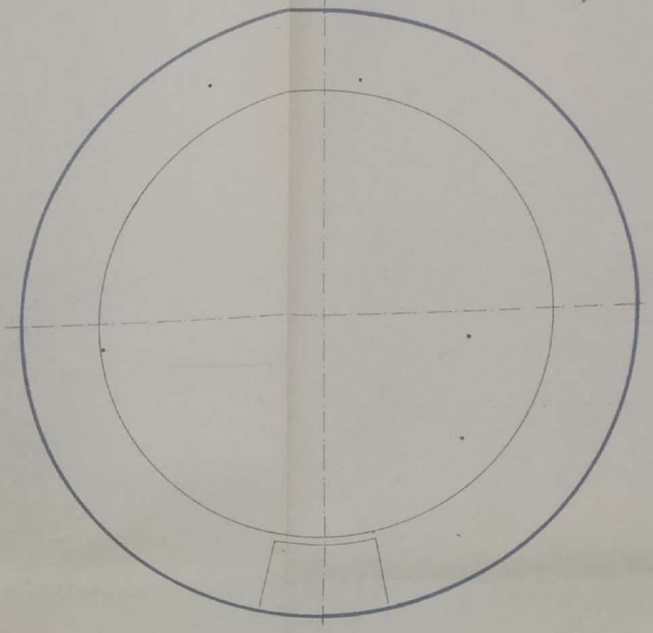


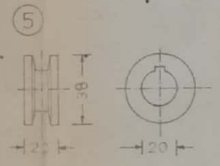


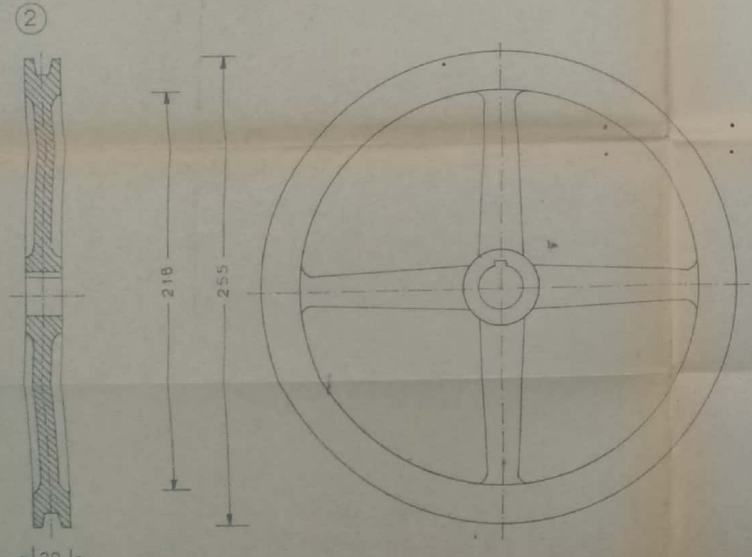


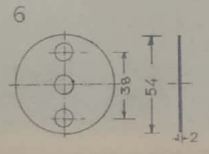


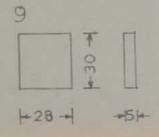


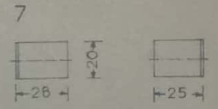


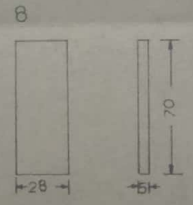


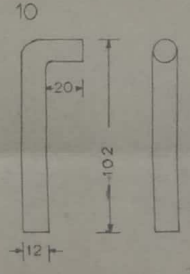












NO	DESCRIPTION	MATERIAL	NO.OFF	FINISH
10	LEVER FOR TOP WHEEL	M S	TWO	
9	RUBBER STRIP FOR M.O.M.	RUBBER	ONE	
8	RUBBER STRIP FOR H.O.M.	RUBBER	ONE	
7	HOLDER FOR RUBBER STRIP	M.S.	ONE	
6	CONTROL PLATE	POLYSTYRENE	ONE	
5	PULLEY OF MOTOR SPINDLE	C I	ONE	MACHINE
4	FLOUR COLLECTING CHANNEL	POLYSTYRENE	ONE	MOULD
3	FOOT STEP BEARING	C I	ONE	
2	PULLEY OF MAIN SPINDLE	C I	ONE	MACHINE
1	HOPPER	POLYSTYRENE	ONE	MOULD

DIPLOMA PROJECT - DOMESTIC FLOUR MILL

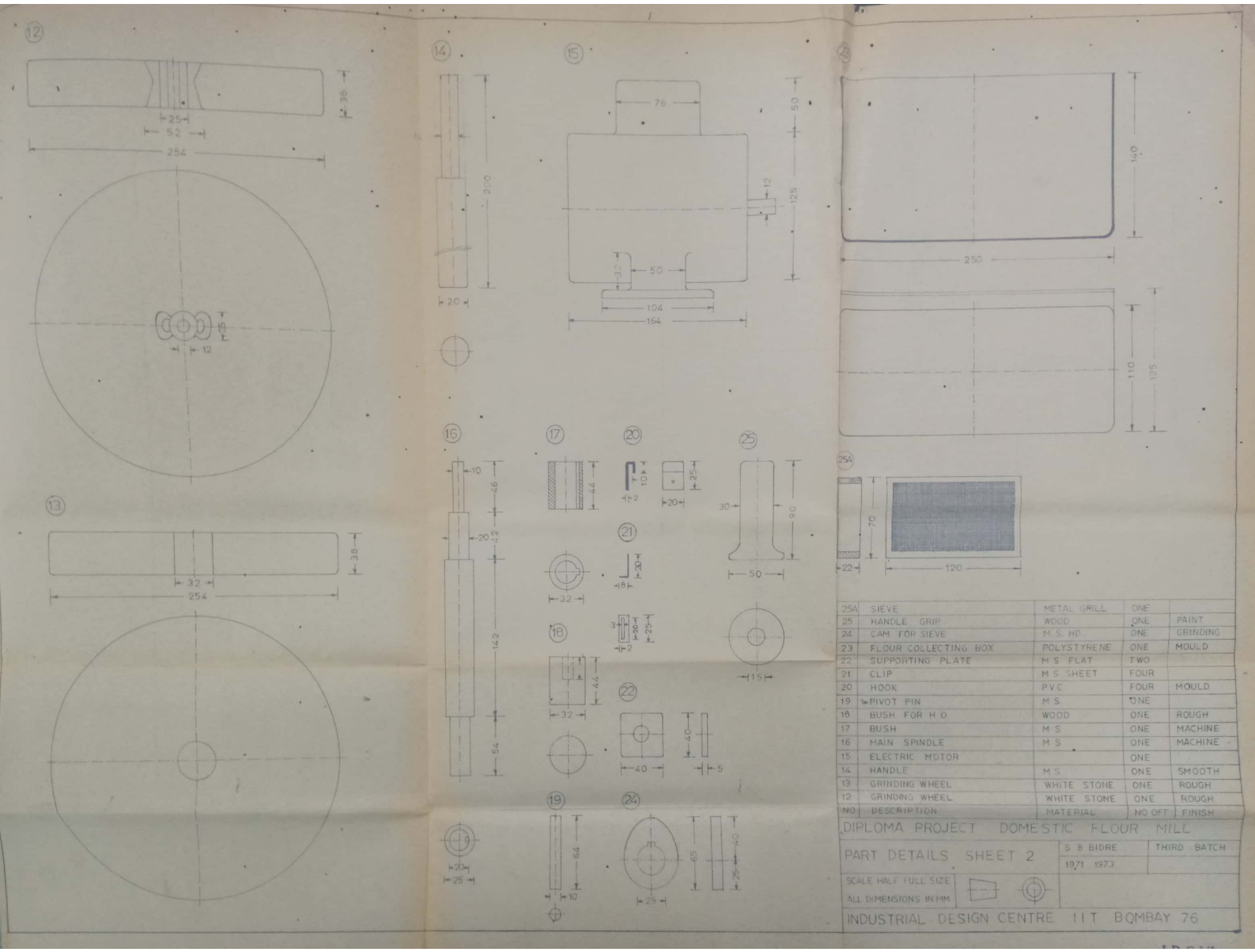
PART DETAILS SHEET - 1

S.B.BIDRE
1971 1973

THIRD BATCH

SCALE HALF FULL SIZE
ALL DIMENSIONS IN MM

INDUSTRIAL DESIGN CENTRE, I.I.T. BOMBAY - 76



25A	SIEVE	METAL GRILL	ONE	
25	HANDLE GRIP	WOOD	ONE	PAINT
24	CAM FOR SIEVE	M.S. HD	ONE	GRINDING
23	FLOUR COLLECTING BOX	POLYSTYRENE	ONE	MOULD
22	SUPPORTING PLATE	M S FLAT	TWO	
21	CLIP	M S SHEET	FOUR	
20	HOOK	P V C	FOUR	MOULD
19	PIVOT PIN	M S	ONE	
18	BUSH FOR H D	WOOD	ONE	ROUGH
17	BUSH	M S	ONE	MACHINE
16	MAIN SPINDLE	M S	ONE	MACHINE
15	ELECTRIC MOTOR		ONE	
14	HANDLE	M S	ONE	SMOOTH
13	GRINDING WHEEL	WHITE STONE	ONE	ROUGH
12	GRINDING WHEEL	WHITE STONE	ONE	ROUGH
NO	DESCRIPTION	MATERIAL	NO OFT	FINISH

DIPLOMA PROJECT DOMESTIC FLOUR MILL

PART DETAILS SHEET 2

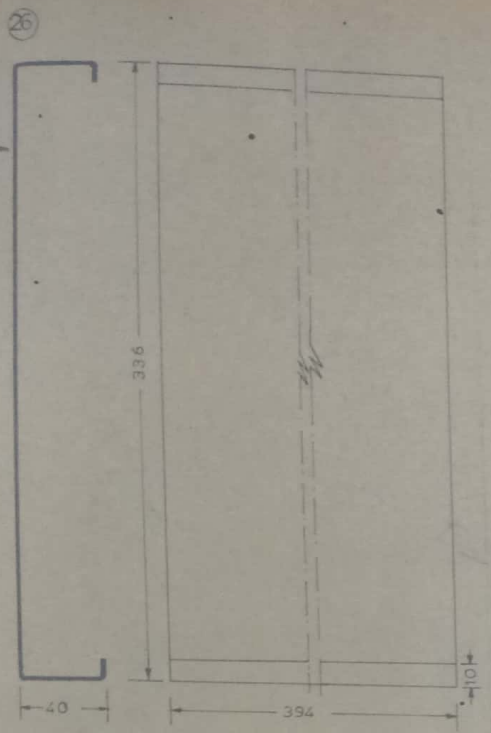
S B BIDRE THIRD BATCH

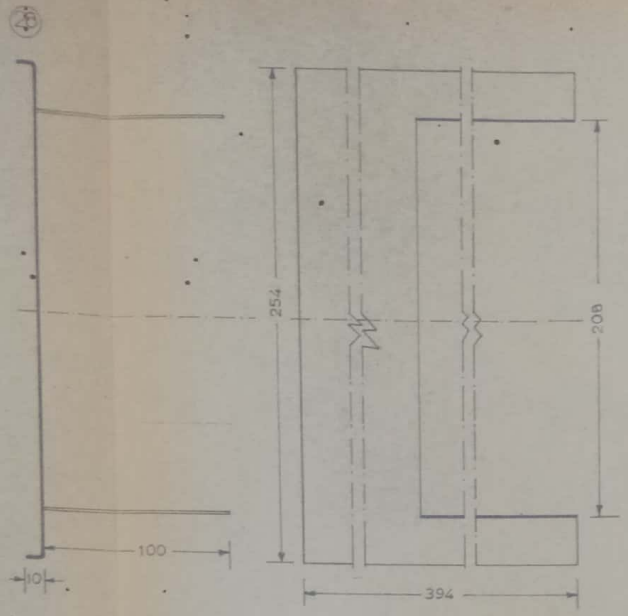
1971 1973

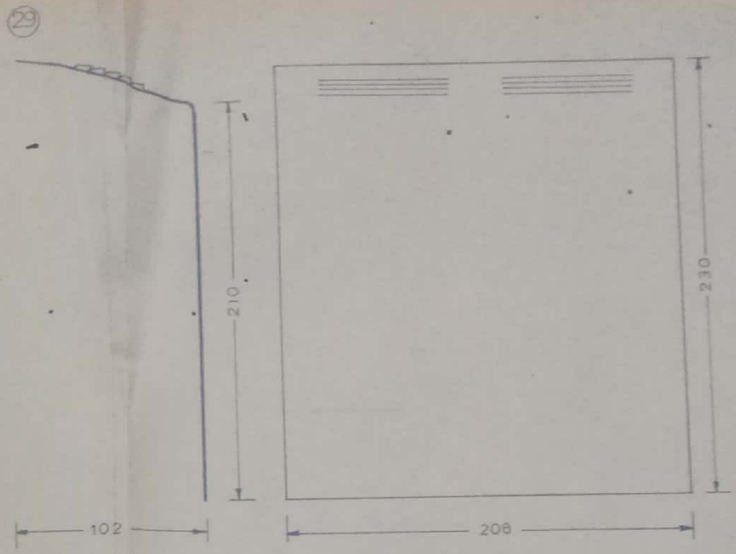
SCALE HALF FULL SIZE

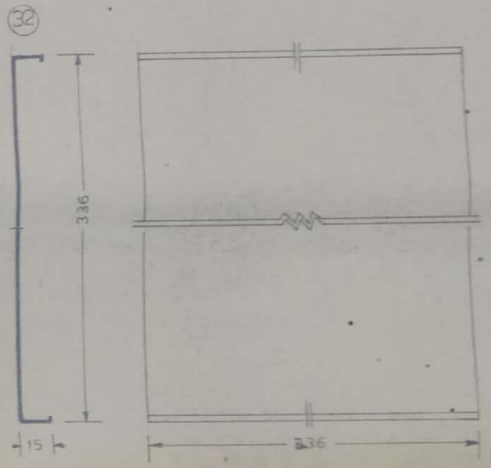
ALL DIMENSIONS IN MM

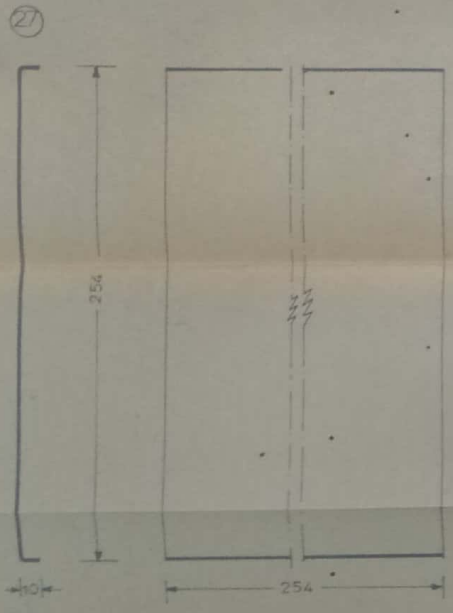
INDUSTRIAL DESIGN CENTRE IIT BOMBAY 76

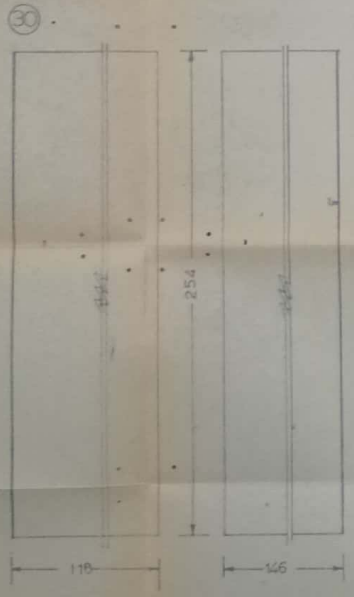


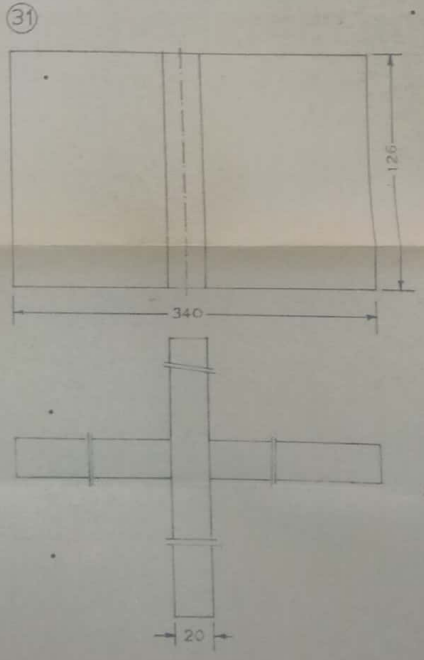












NO.	DESCRIPTION	MATERIAL	NO OFF	FINISH
32	LID	M.S.	ONE	PAINT
31	STAND FOR H. D. MILL	WOOD	ONE	SMOOTH
30	SCREEN	SHEET METAL	ONE	PAINT
29	COVER FOR MOTOR	SHEET METAL	ONE	PAINT
28	REAR COVER	SHEET METAL	ONE	PAINT
27	FRONT COVER	SHEET METAL	ONE	PAINT
26	SIDE COVER	SHEET METAL	TWO	PAINT

DIPLOMA PROJECT DOMESTIC FLOUR MILL

PARTS SHEET 3 | S B BIDRE 1971 73 | THIRD BATCH

ALL DIMENSIONS IN MM
SCALE HALF FULL SIZE

INDUSTRIAL DESIGN CENTRE I I T BOMBAY 76

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