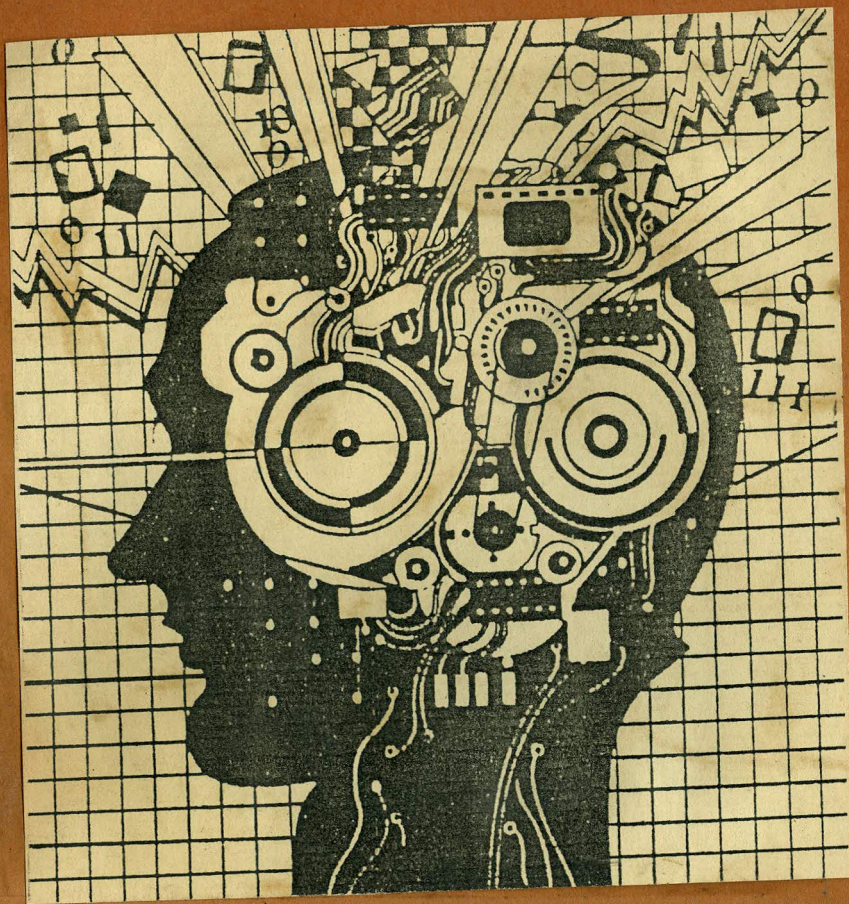
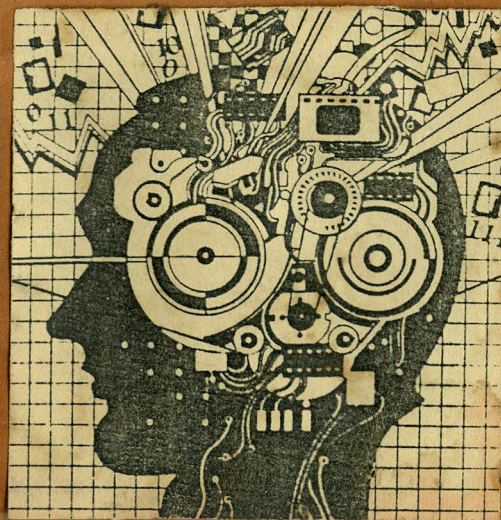




THINKING PROCESS AND ITS RELATION TO VISUALIZATION AND FORM GENERATION.

SPECIAL PROJECT REPORT
BY
MADHURI VETSA

IDC, IIT BOMBAY.



THINKING PROCESS AND ITS RELATION TO VISUALIZATION
AND FORM GENERATION

SPECIAL PROJECT

By

MADHURI VETSA

Submitted in partial fulfillment of the requirement
for the Master of Design degree in Industrial Design.

Guide

Prof. U. A. ATHAVANKAR

INDUSTRIAL DESIGN CENTRE
INDIAN INSTITUTE OF TECHNOLOGY
BOMBAY 400 076

APRIL 1989

APPROVAL SHEET

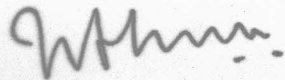
The Special Project entitled " THINKING PROCESS AND ITS
RELATION TO VISUALIZATION AND FORM GENERATION "

by

MADHURI VETSA

is approved for the partial fulfilment of the requirements
for the Master of Design Degree in Industrial Design

Guide :

A handwritten signature in dark ink, appearing to be 'W. H. M.', is written next to the word 'Guide :'. The signature is stylized and cursive.

ACKNOWLEDGEMENT

I am greatly indebted to my guide Prof. U. A. Athavankar for his valuable guidance through every stage of this project. I owe my sincere thanks to all the students who willingly participated in my design experiments. Without their help this study would not have been possible.

I would like to thank Shri M. B. Joshi and Shri Upadhyay who helped me with the library facilities.

I also owe my thanks to IDC faculty, staff and fellow students who helped me all along this project.

April 1989
IDC

MADHURI VETSA

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1. PRODUCT DEVELOPMENT

1. PRODUCT DEVELOPMENT :

Largely for the development of a product, the most important criteria are the functional, aesthetic, and ergonomic considerations. The various stages involved in the product development are :

1. Product conceptualization
2. Drawing CAD
3. Prototyping
4. Mould making CAM
5. Final production

The whole process once upon a time was solely controlled by people and machinery, but now computers are extending their utility to these areas also, by having CAD for engineering drawings and CAM for manufacturing processes. But there has been no such computer input at the product conceptualization level, which is the stage where there is maximum creative involvement of the designer. It is at this stage where the problem is understood, decisions are taken in terms of volume, size their shape and finally decisions of details, graphics and colours etc. This lack of any computer support/help in this area, drew the interest and thus this became the area of concentration for this study.

2. ROLE OF A COMPUTER

2. ROLE OF A COMPUTER

Advancement in computer technology in terms of software, like computer aided design (CAD) where computer graphics are used for automated drafting, designing and analysis, and computer aided manufacturing (CAM) where the computer controls certain manufacturing operations like welding, drilling, milling etc have changed the entire design scene. These new methods are exceedingly fast, accurate, easy and take the boredom out of repetitive jobs. Not only these, but there has been advancement in User interface technology, with newer input devices being experimented with, like a data glove which helps one to use virtual tools and objects just like one would use real tools and objects ; Force feed back system where a sophisticated tactile feed back system with a data tablet which not only senses the position of the drawing stylus, but also the orientation and amount of force applied. The computer uses this information to simulate the articulation of a piece of charcoal with varying pressures and angles input from the hand and thus the width, and texture of a line vary.

All this shows the awareness of the translating the capabilities of the human hand into a computer system.

3. DESIGNER AND THE COMPUTER

3. DESIGNER AND THE COMPUTER

There are lots of application programmes on the computer which would help a designer like 3D modelling, technical illustrations, graphics, charts, layouts, etc., in order to build forms. But the way in which all these programmes draw solids is a lot more complicated compared to the ease with which one does just with a paper and a pencil. This is because the computer can't work/sketch out as quickly as a person can when an idea is clear, it needs a lot of data to be inputted and also some mathematical formulae. It's not just enough to have an interface that is user friendly so all these problems could be minimised but it is also necessary that it is one step above this and there is some compatibility with the actual way in which a designer thinks and does. Thus came an indication as to why not study the designer's thinking styles and see if the computer and this could be linked into a process.

A designer exercises his/her creativity best when developing concepts, and solutions to a problem. This process is very personalized and also each person has a particular style. One can't be forced out of this and made to adopt different methods for creative designing, which is what the present programmes are doing. So if one wants to use the capabilities of the computer in the evolution of a design, the designer has to relearn all the ways possible and not possible on a computer and re-orient the style of thinking. There could be serious resistance towards such a step for this would mean the designer sacrifices his/her style of thinking. Also since the computer is the new tool that a designer is going to use, it would be better if the tool is better designed and flexible enough to allow the designer to combine his/her style.

Just by understanding the design process and directly translating it into a software would be grossly incorrect and also the capacities of the media will not be exploited at all. Thus one would have to design the right sort of a work station where the system would have best of both worlds - the memory, speed, accuracy of a computer plus the flexibility, simplicity of traditional design methods.

An absolutely new system would take a lot of time for a person to adapt to. Until the change is made there is always a transition period where both systems are equally important. May be new design students could start on such a new system and adapt easily and faster when compared to designer who have been taught in the traditional way of sketching, model making etc. Thus at this stage the development of a system that is closer to the existing styles of thinking

would be most appropriate.

A study would give a lot more insight one felt to the creative thinking/visualization process, practised by design students to develop products. Thus in this project an attempt has been made to conduct experiments with a group of students who were given design problems with constraints and asked to solve in for a limited time, and recorded on stills and video. Students were chosen because it was convenient for them to spare some time. The observations and analysis would lead to a conception of a futuristic designer aide-de-computer.

4. METHODOLOGY

4. METHODOLOGY :

For this study two product design exercises were set and given to the students. The products chosen were (a) A Battery Eliminator (b) A door knob. The choice was deliberate for in product (a) the inner component layout more or less governs the size and also the form where as in product (b) ergonomics and aesthetics of the form are important as it is an important visual element.

The problem statement for both are as follows :

BATTERY ELIMINATOR

A Battery Eliminator is a convenient device which allows uninterrupted use of a radio, a transistor or a walkman where A.C. power supply is available.

The basic components are a Transformer (Stepdown), a Capacitor and a few Resistors. Varying voltages (3V to 12V) can be obtained, sometimes in a single device.

Existing ones have several problems like :

- a. No Cord Storage Area
- b. Exposed Pins
- c. Poor Ventilation

Also the overall form is a mere cuboidal unit.

It ought to look compact but it does not.

An innovative look for this small but useful device is very much needed.

Assume your own constraints for :

- a. Materials (Housing)
- b. Applications (Particular)
- c. Shapes/Forms.

Please put down all ideas as they occur to you and also the sequence in which they have occurred. Your remarks for each idea as they occur to you should also be noted.

DOORKNOB

A Door Knob is an important part of the door.

It is the only part of the door that is touched most often.

Most of its functions, i.e. whether to pull it or push it, to rotate it or twist it, so that the door opens are not communicated at all.

Sometimes it also performs the functions of a peg to hang umbrellas, shirts, calendars etc. 6.

Multitudes of them are available, each different formally and in terms of the materials and colours too.

Can you think of a particular environment, other than the usual office, home sorts (eg. a museum, a hotel, a theatre) and design more formally communicating door knobs? The decisions about the size, mechanism etc. are your own.

Please put down all ideas as they occur to you and also the sequence in which they have occurred. Your remarks for each idea as they occur to you should also be noted.

The study was done in 3 stages :

Stage 1 : Two groups of 4 students each were given the two problems and in the time duration of one hour, they were asked to solve the design problem and also record every thought and sketch, to do it exactly in the way they would solve other design problems. The students were provided with tracing paper, plain white paper and a graph sheet too.

Stage 2 : Two groups of 2 students each were given the same problem but now the time duration was increased to two hours and they were asked to make models to support their concepts. They were given the freedom to choose any material, plaster, thermocole, cardboard, clay, or any other of their choice. A photographic documentation was done here.

Stage 3 : One student was given the door knob problem. Here he was also asked to design a mechanism for it, and the whole process was recorded on video. This was later analysed along with the student explaining each stage of his design and what influences he had.

Following pages show the documentation of the design sequences followed by the students.

Series A - belongs to stage 1.
Series B - belongs to stage 2.
Series C - belongs to stage 3.

5. DESIGN SEQUENCE DOCUMENTATION

Series A

Series B

Series C

5. DESIGN SEQUENCE DOCUMENTATION

Series A	7.
Series B	19.
Series C	23.

NAME : SURESH G. BHAT

AGE : 24 Years

STATUS : STUDENT (Senior Product Designer)

1.5 years of Design experience

PREVIOUS QUALIFICATION : Mechanical Engineer

Following is the documentation of the
design sequence followed by this student
to design a BATTERY ELIMINATOR

Total time taken : 60 Minutes

Effective working time : 30 Minutes

■ Decision of constraints

1. Design a 12V Multi-pin battery eliminator.
2. Use the existing components (unless better components can be found).
3. Reorganise internal arrangement for compactness.
4. Integrate form and control panel.
5. Analyse why present form and arrangement is as is.

12 Design:

1. Analysis of Present Product:

- a. There are no electronic components that may get affected by heat.
- b. Excess space is wasted inside - possibly for air circulation but still it is unbalanced on either side of transformer.
- c. Arrangement of components is haphazard and all electrical connections are made simply by soldering together the relevant wire ends.
- d. A fuse and a pilot lamp are provided in addition to a switch on the eliminator itself.
- e. The body is made of 2 pressed sheets.
- f. Only 4 assembly screws are visible on the outside all others are underneath the base.
- g. A table on an Al sheet is stuck on to the body making it look like an alien element.

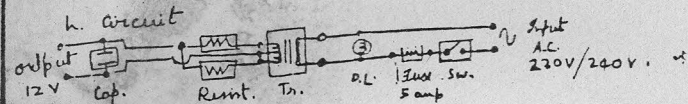
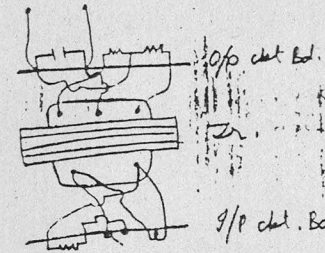


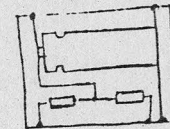
Fig 1.1. Preconcept level:

Redefinition of the constraints and an indepth analysis and understanding of an existing product including a circuit diagram.

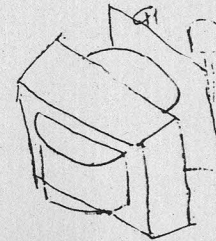
Design



1. Organise the Input & output peripherals on ch. boards. This will simplify replacement of components.



O/p will require a separate ch. bd. which casing itself can serve to mount I/P accessories.



Actually I'd prefer to work in 3D - better visualization
Now I'll go over to the tracing paper & graph sheet.

Fig 1.2.

Understanding of the inner components and their arrangements leading towards design.
Use of 3D sketches begins here.

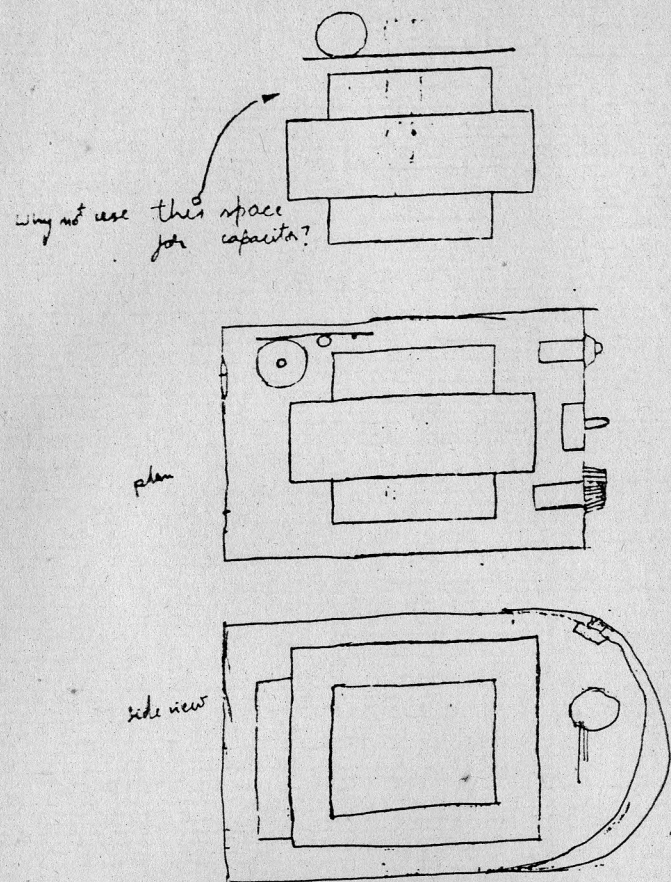
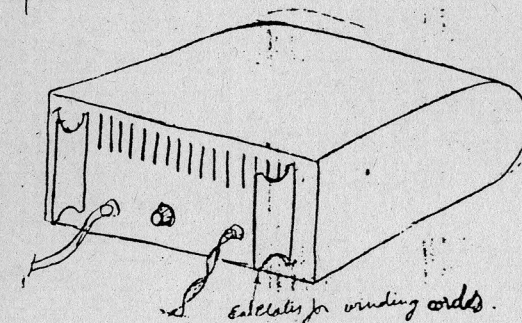
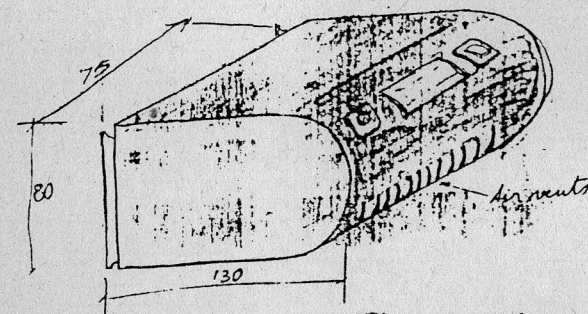
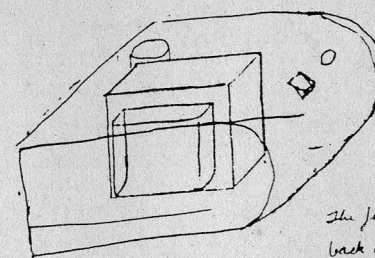


Fig 1.3 Concept level:

Use of a key element & building up of a form by arranging other elements around it.

Use of plan, elevation, side view to aid form visualization.



time taken 1 hr. effective working time 1/2 hr.

Fig 1.4.

Use of a transparent frame with key element inside. Decisions of controls and details locations.

Final concept complete with dimensions, details in orthographic views.

OBSERVATIONS AND COMMENTS :

This student spent a considerable amount of time in understanding and re-stating the given problem. He did this in terms of writing and only then started actual sketching.

The design started as a re-arrangement of inner components including the electrical connections and relations.

This student expressed a preference to work in 3D for he felt it gave him a better visualization, but continued to sketch for he assumed the problem required it.

The sketching has been in terms of plans mostly. Only towards the end he used orthographic views complete with dimensioning, shading and full details.

This student had only one solution and felt until he developed it completely, a new one couldn't be approached.

Also this student expressed a wish to take small break while thinking about the solution, by going away from the work spot.

NAME : VINAYAK P. NABAR

AGE : 29 Years

STATUS : STUDENT (Senior Product Designer)

PREVIOUS QUALIFICATION : ARCHITECT
4.5 years of work
experience
1.5 years of Product
design

Following is the documentation of the
sequence followed by this student to
design a DOOR KNOB

Total time taken : 60 Minutes

Effective working time : 40 Minutes

possible environments:

school → main door
class rooms

Library

Hospitals

shops

Restaurants, clinics, consultant rooms

A door knob is not the most important part of a door unless it also works as a locking / latching mechanism for the door.

I use the aldrops as a doorknobs both for my room as well as classroom door both to open and close provided which makes the door handles / knobs redundant.

economy of action
multifunctionality.

The process of opening the door.
unlatching if at all → linear → as in aldrops
rotational → as in Godrej latch.

pushing, pulling, sliding. (to open or close the door)
(pivot / hinge) (sliding) (rotational)

the door knob should communicate both.

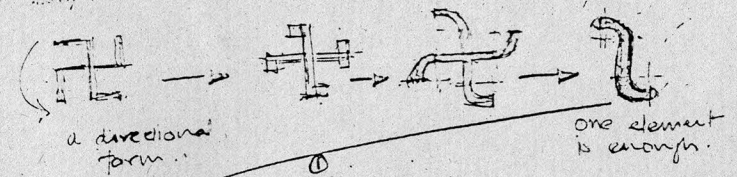
The knob should also communicate

- the environment
- the status of inhabitant
- personal taste, likes, dislikes.
- Key position if any.
- that is the part to be handled / precursor of action

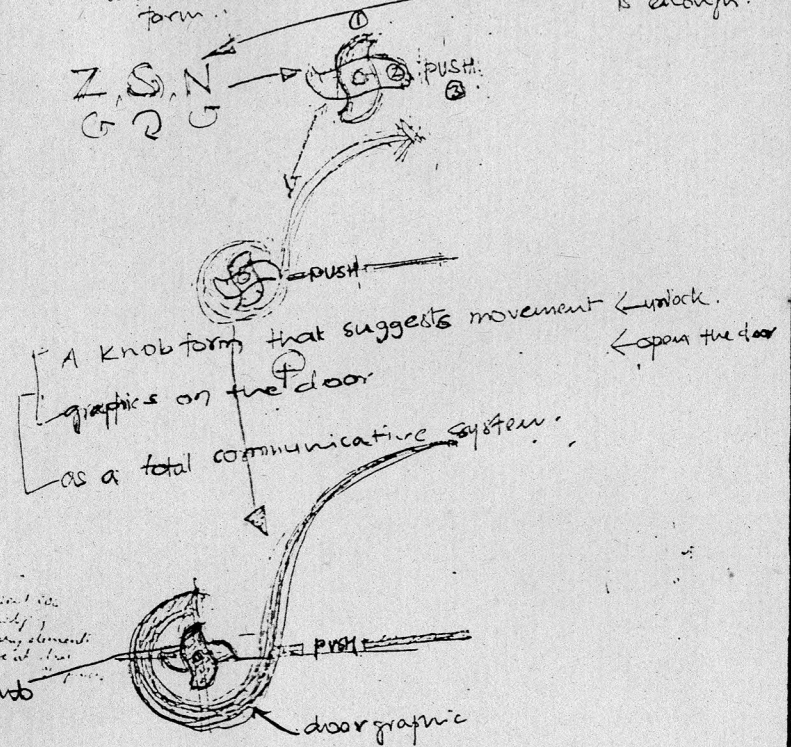
Fig 3.1 Initialization:

Problem studied and restated so as to get clues for function and design.

Activity analysis done to understand the process of opening a door leading to key factors for design as well as a product brief.



Z, S, N
G, Q, G

Fig 3.2. Preconcept level and Conceptualization:

Exploration of directional forms to communicate rotation - alphabetically.

Use of the knob form to communicate function.

Use of door graphics and colours to understand the overall effect.

OBSERVATIONS AND COMMENTS :

- o This student expressed the feeling of being lost in the initial design stage.
- o He feels it necessary to contemplate a lot on the problem by restating and analysing before getting down to sketching.
- o He felt that looking at a door knob in isolation wouldn't be valid and the problem environment, and the related items also need to be looked at, to get clues for the function as well as design.
- o He also examined the problem situation with himself as a user to arrive at an activity analysis. This gave him a clue to the key factors of design based on which a product brief was prepared.
- o He was not satisfied with his solution for he felt he used too many secondary elements like door graphics colour to arrive at a solution, rather than the form itself.
- o He also used his architectural experience in developing the door graphic which caused - turn (i.e. to unlock) and push (to open the door)

NAME : N. PRASAD

AGE : 26 Years

STATUS : STUDENT - Senior Product Designer
(1.5 years of Design experience)

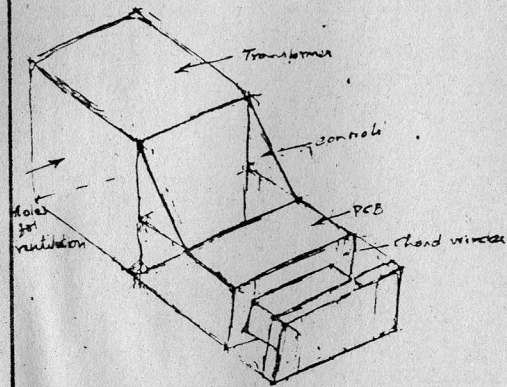
PREVIOUS QUALIFICATION : Instrumentation
Engineer.

2 years teaching
experience

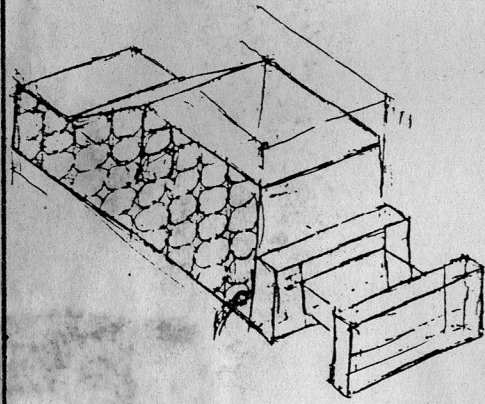
Following is the documentation of the
sequence followed by this student to
design a BATTERY ELIMINATOR

Total time taken - 60 Minutes

Effective working time : 45 Minutes

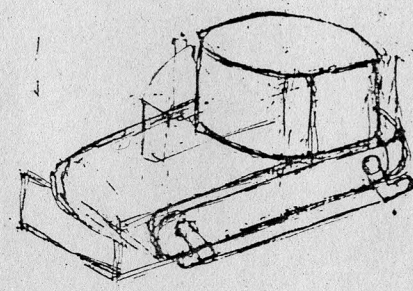


- A hard form
- A small radii can be given
- A large volume for Transformer
- The cord window in front - not desirable

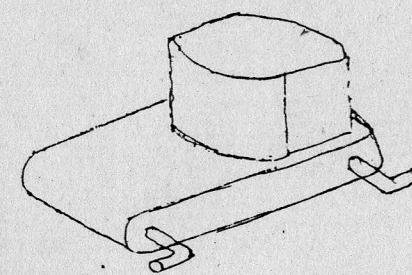


- The grille for ventilation can be a major visual element.
- The cord window is at the back.
- A more refined sketch

Fig 2.1 Concept level : Concept 1
Use of geometric blocks to build up the form.
Positions allotted to the various components inside,
govern the size.
Conceived as a hard form.
Use of overlay technique to arrive at the refined sketch.
Detailing done only for ventilation.



- Simple sketch
- A soft form
 - Initial sketch



- A refined sketch by overlay technique

Fig 2.2 Concept 2
Use of an expression - soft to arrive at this form. Sub-
stantiated by large radii all around.
Positions allotted to the inner components very different
from first concept.
Only one detail - cord window given a thought.

OBSERVATIONS AND COMMENTS :

This student spent some time initially to understand the problem. The arrangement of inner components was given a thought, no sketches or written matter to support it.

Used geometric building blocks like cubes to build the forms.

Dimensions of the inner components was used intuitively to arrive at product size.

Used overlay techniques to refine the sketches.

He did not use any details in terms of controls, or switches.

This student sketched only in 3D i.e. using isometric figures.

He used expressions like hard, soft, for developing the forms.

NAME : UNMESH KULKARNI

AGE : 23 Years

STATUS : STUDENT - Senior Product Designer
(1.5 years of design
experience)

PREVIOUS QUALIFICATION : Mechanical Engineer

Following is the documentation of the
sequence followed by this student to
design a DOOR KNOB

Total time taken : 5 hours

Effective working time : 2 hours.

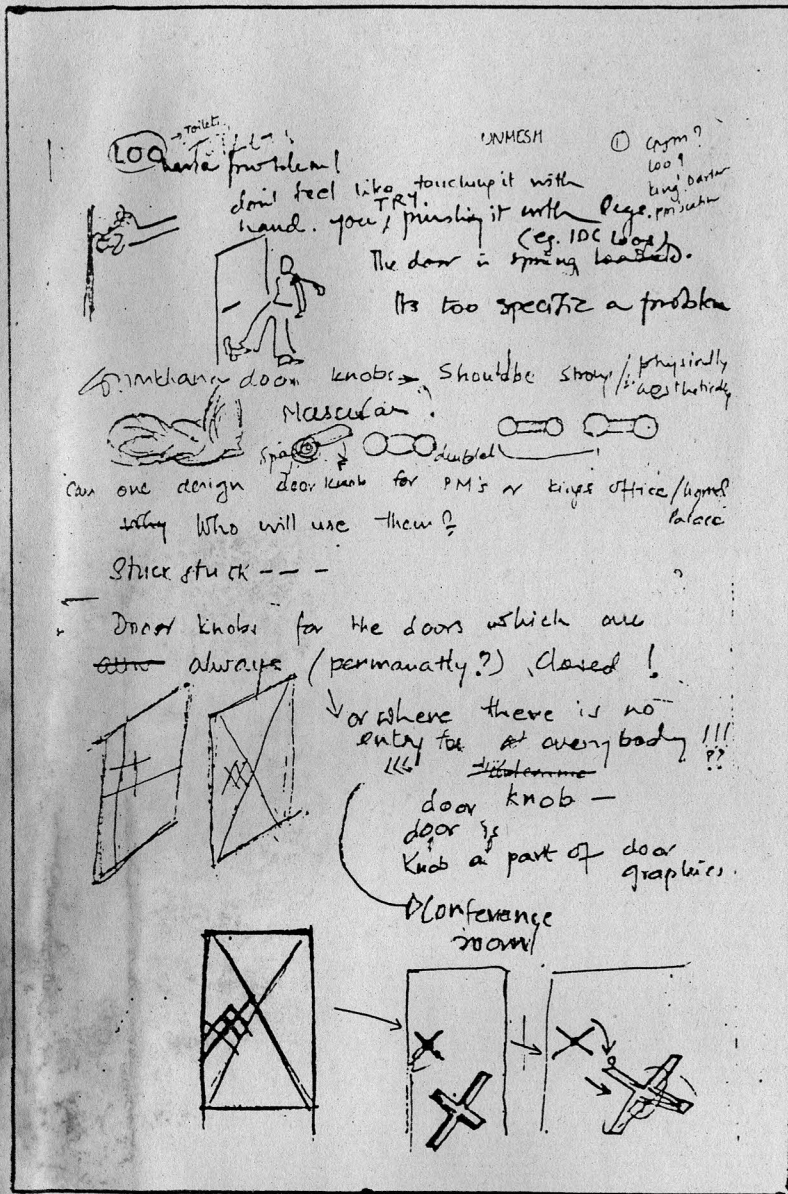


Fig 4-1 Preconcept level:

Consideration of various environments to obtain clues for the design.

Use of symbolic expressions to communicate the environment through the knob design.

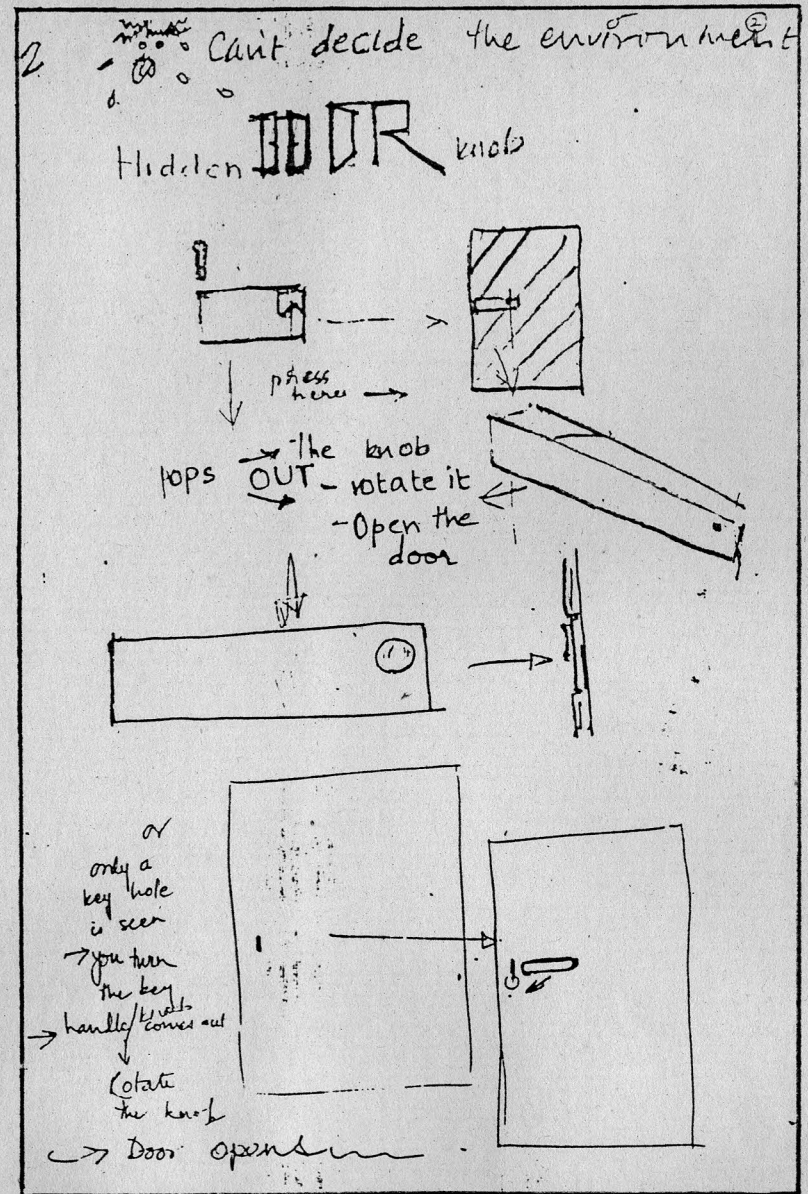


Fig 4-2.

Exploration of environments, expressions related to them continues.

Trying to discover an environment which he would like to design for.

Use of mechanisms too to arrive at different solutions.

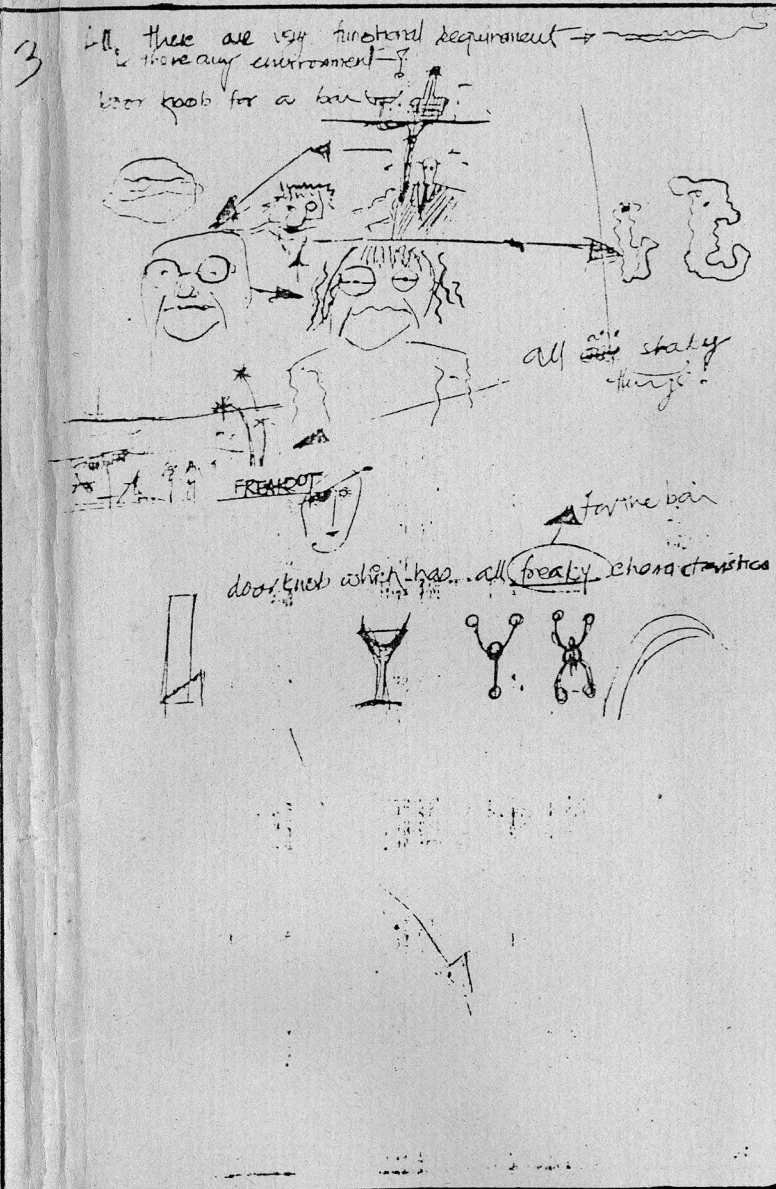


Fig 4.3

A lot of doodling while searching for the environment of his choice.

A lot of freaky sketches related to the environment being tried out, indicating the search process is getting boring.

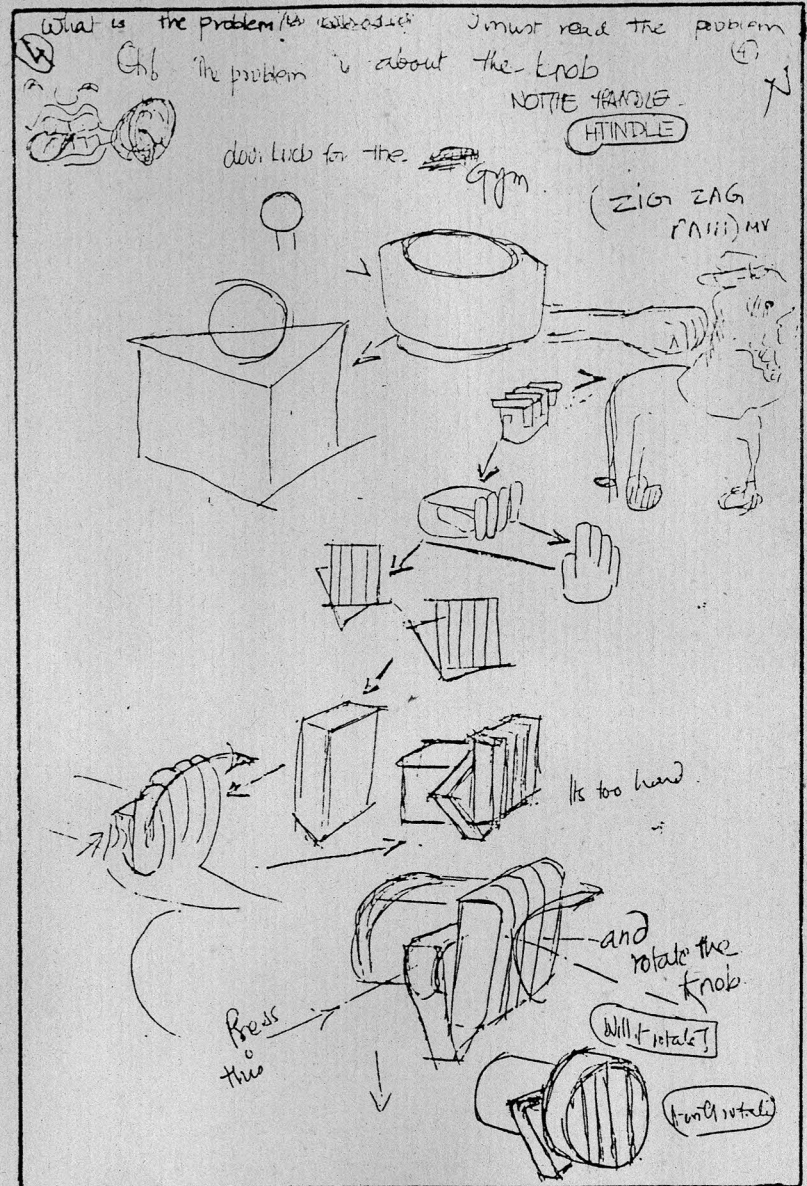


Fig 4.4 Conceptualization : Concept 1.

Reference to the problem sheet to obtain further clues for design.

Decision on designing a door knob for a Gym.

Decision on expression to communicate the environment.

Also a lot of exploration on the form of the knob.

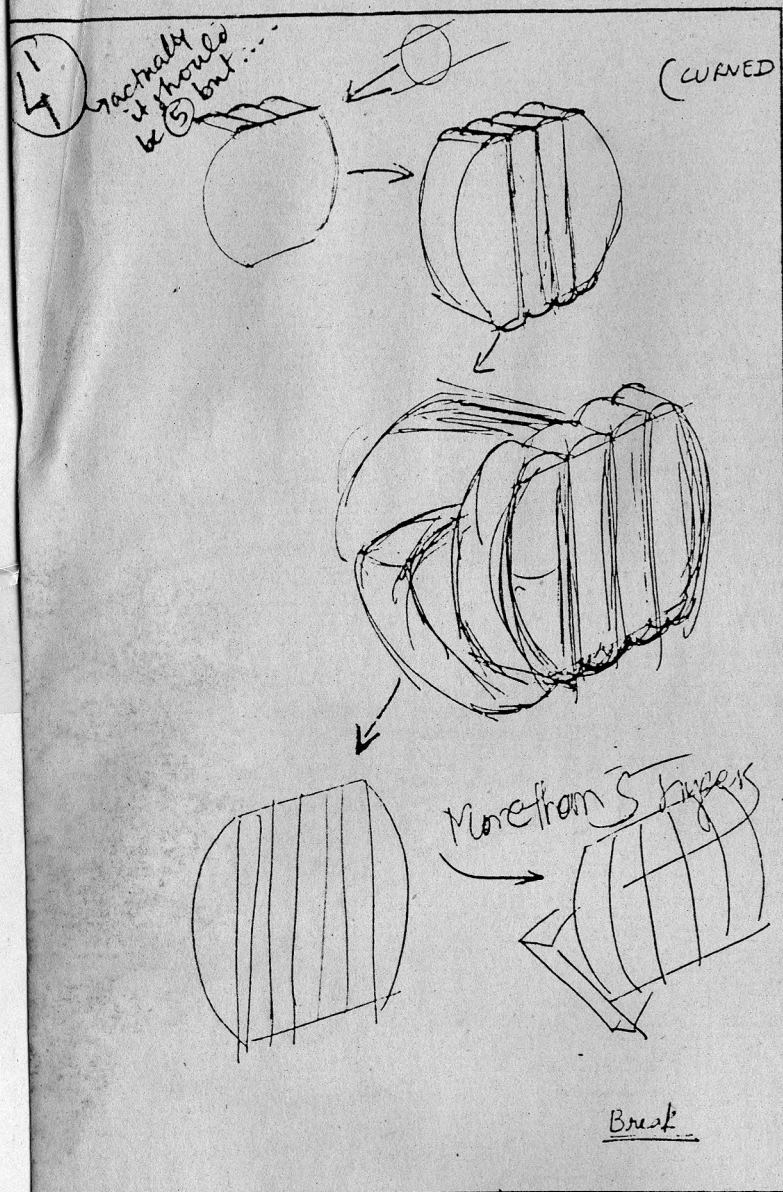


Fig 4.5

Normal exploration of the "fist" concept continues, but took a break here.

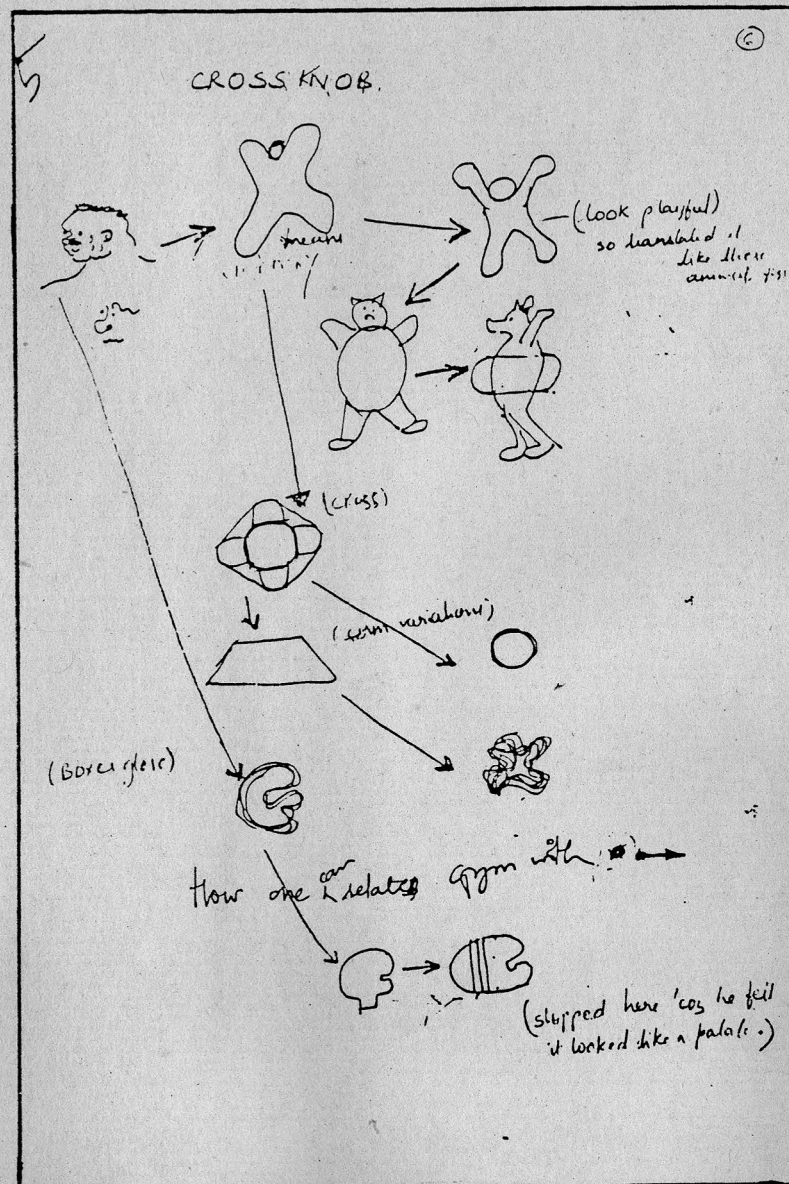


Fig 4.6 concept 2:

Since environment for design - Gym was decided upon a lot of doodling done here to discover new expressions related to it like victory, boxing gloves, etc.

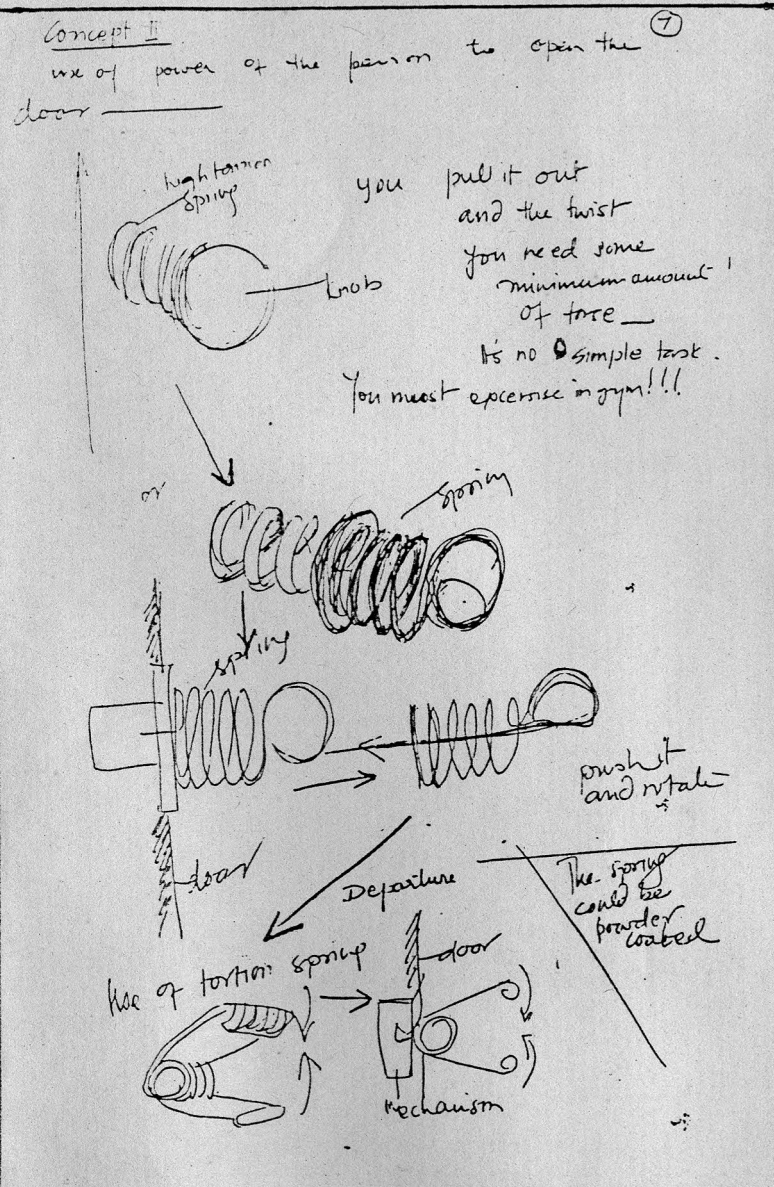


Fig 4.7

The exploration done in fig 4.6 results in the generation of concept 2.

Decision of using "Power" as an expression to develop this concept.

Relating items which indicate power to the knob - like a coiled spring - which gave another idea - the use of a torsion spring.

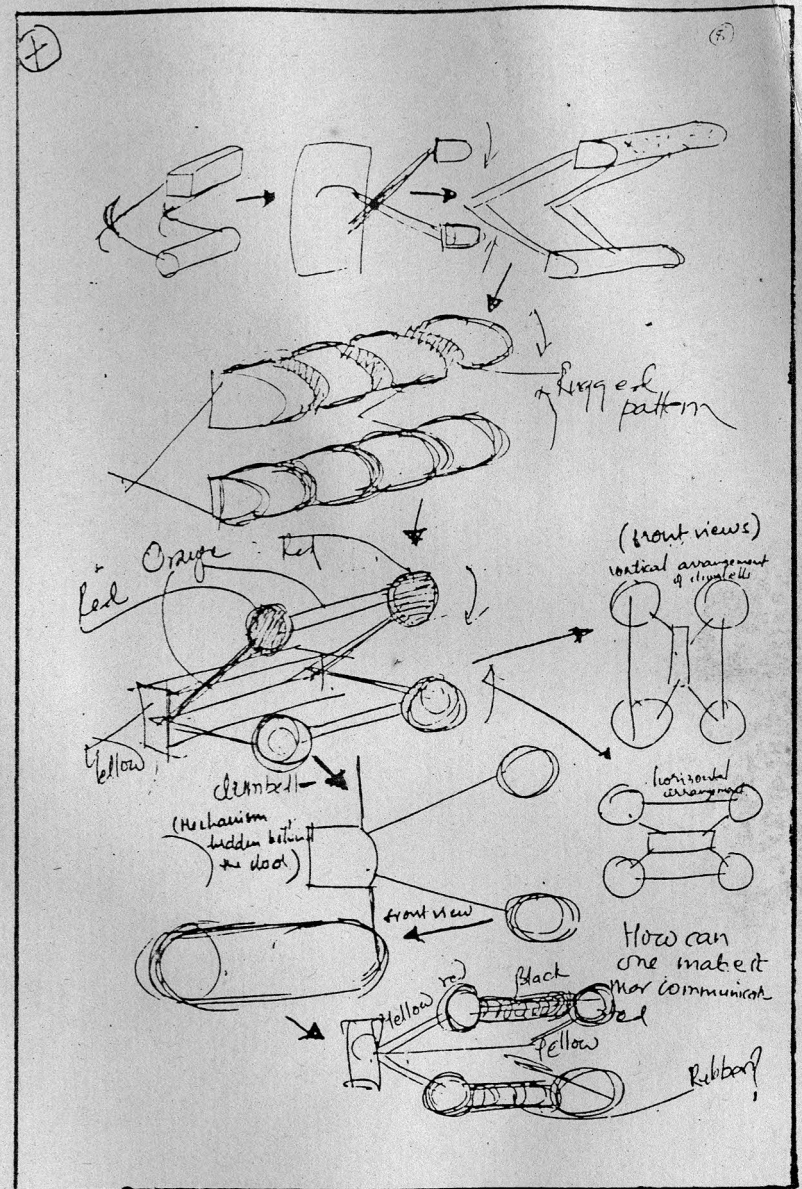


Fig 4.8 Combination of Concept 1 and Concept 2:

Torsion spring-taken from fig 4.7 is the basis (as a mechanism to express power) for this concept.

Formal exploration by taking clues from expressions of ruggedness, dumbbells, colours.

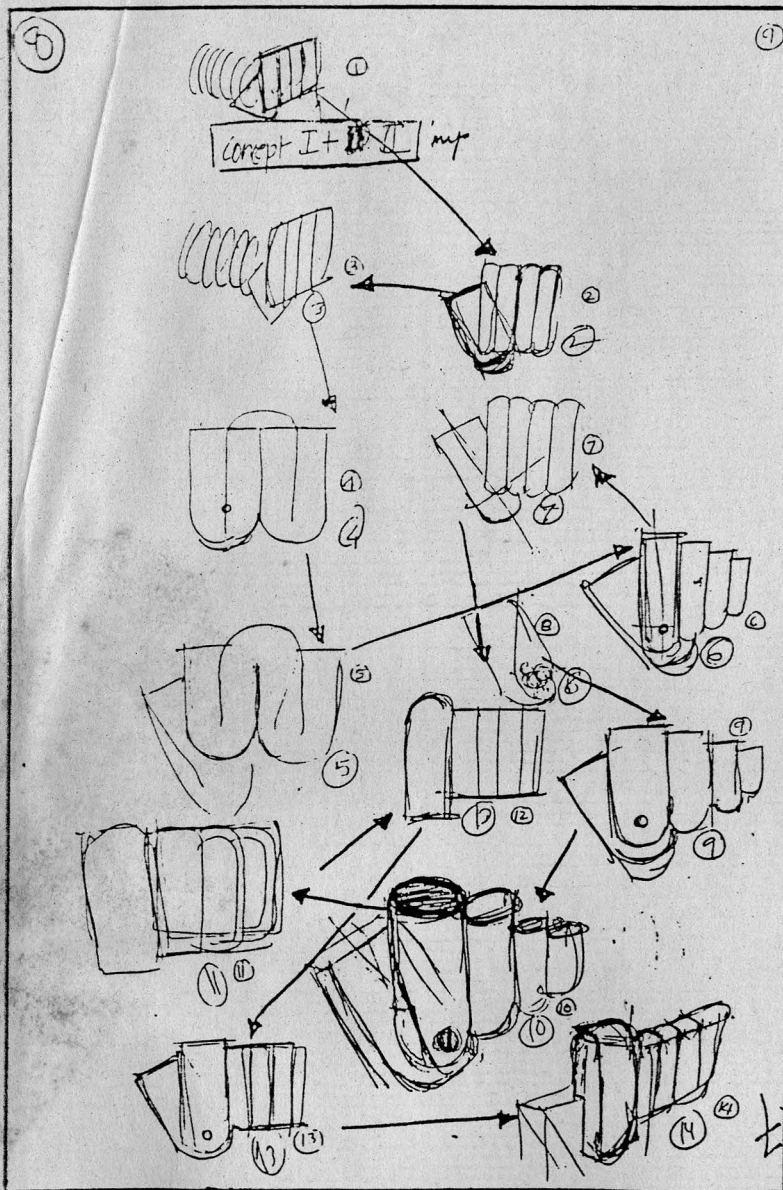


Fig 4.9

Refinement of the expression "fist" to develop it into a product form. Exploration of dimensions, arrangement of members, inclinations.

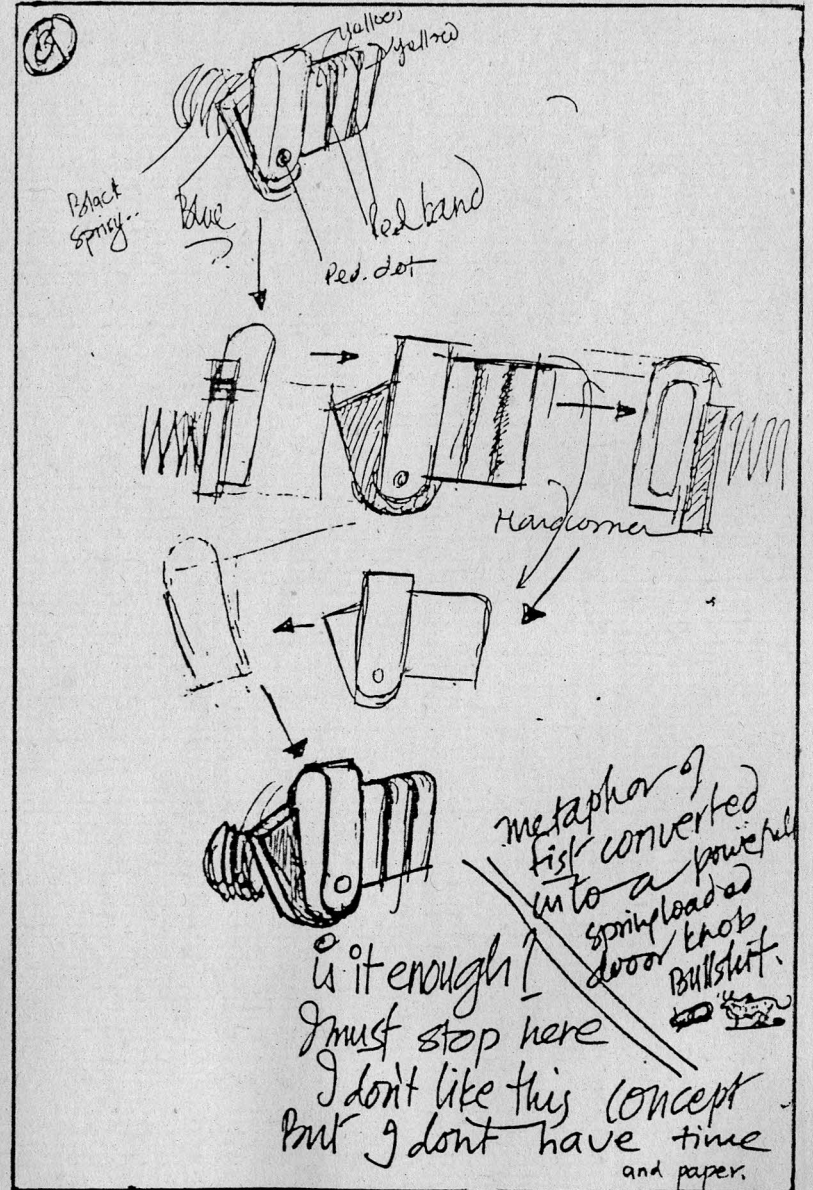


Fig 4.10

The final design solution for this expression, developed complete with side views, sections, colours. This person thought this solution is insufficient, but stopped here.

OBSERVATIONS AND COMMENTS :

This student did a lot of doodling before arriving at any design.

The initialization stage was done through the discovery of new environments and their expressions. A lot of exploration of forms related to the environments and their expressions lead him finally to one which he was satisfied enough to explore further.

During the initial exploration, the handle was sketched along with a door which indicated the use of the door, to judge the positioning and scale of the knob.

He got bored with the multitude of environments and referred back to the problem sheet and then decided to design a knob and not a handle.

It was after this, the environment "GYM" was chosen and then two concepts were developed.

Used 2D as well as 3D while sketching. The shift to 3D was only when he was sure how the form was .

Used sections, plans, elevations sometimes,

This student took a lot of time, nearly 2 hours to complete the exercise, though he took lots of breaks in between where he concentrated on some other work.

NAME : NIKHIL KHOSA

AGE : 23 Years

STATUS: STUDENT - Junior Product Designer
(1 year design experience)

PREVIOUS QUALIFICATION : Mechanical Engineer

Following is the documentation of the
sequence followed by this student
to design a BATTERY ELIMINATOR

Total time taken : 3 hours

Effective working time : 2 hours.

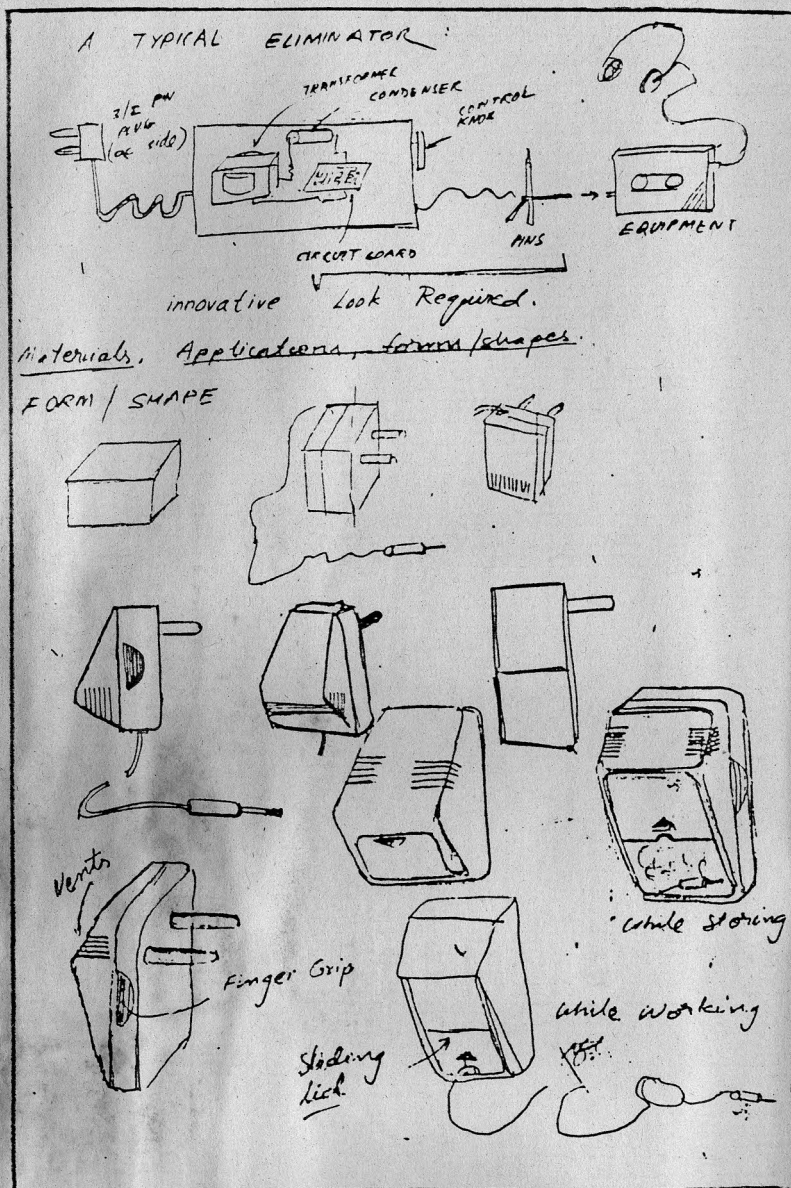


Fig 5.1 Initiation and Preconcept level:

Understanding the existing product through a sketch of the internal arrangement of the components.

Definition of the goals.

Use of basic geometric block as a starting point. Use of orthographic sketches.

Importance to certain details like vents, finger grip, cord storage.

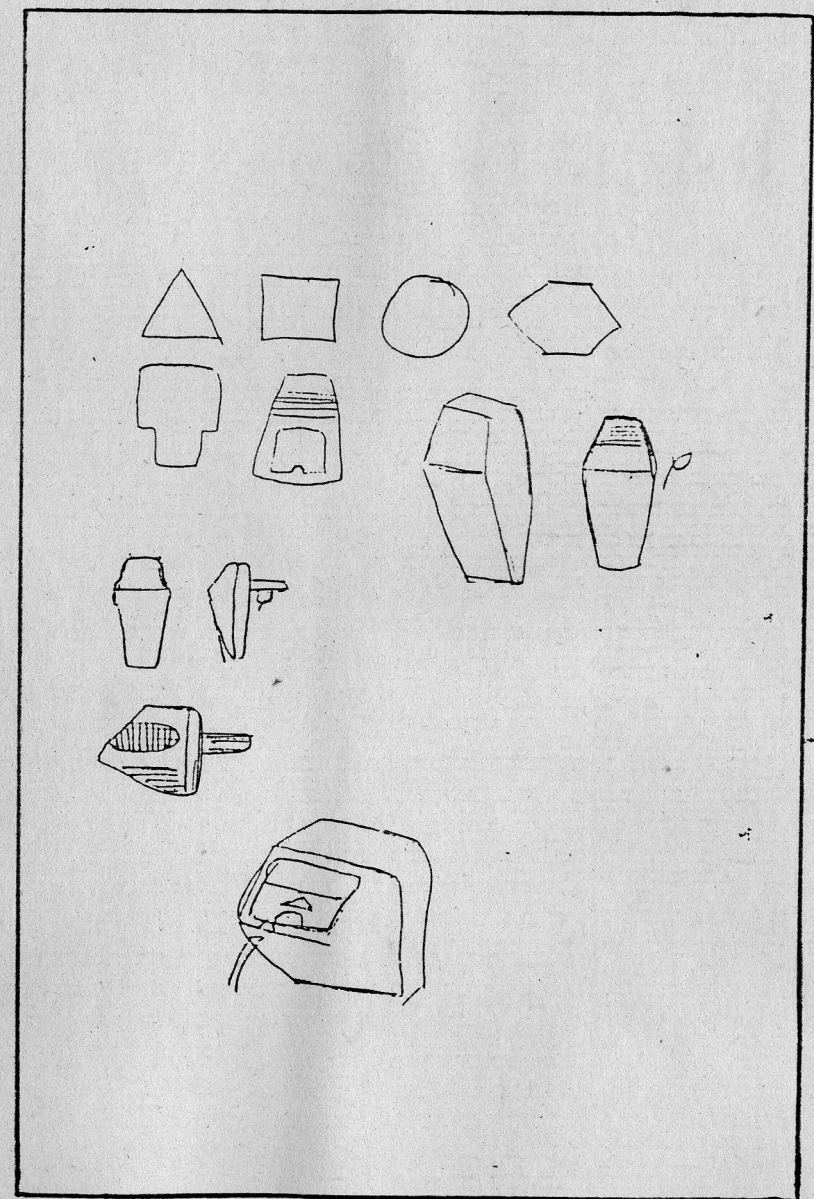


Fig 5.2:

Departure from developing the idea chosen in fig 5.1. Exploration of newer forms, but came back to something similar to the one in fig 5.1.

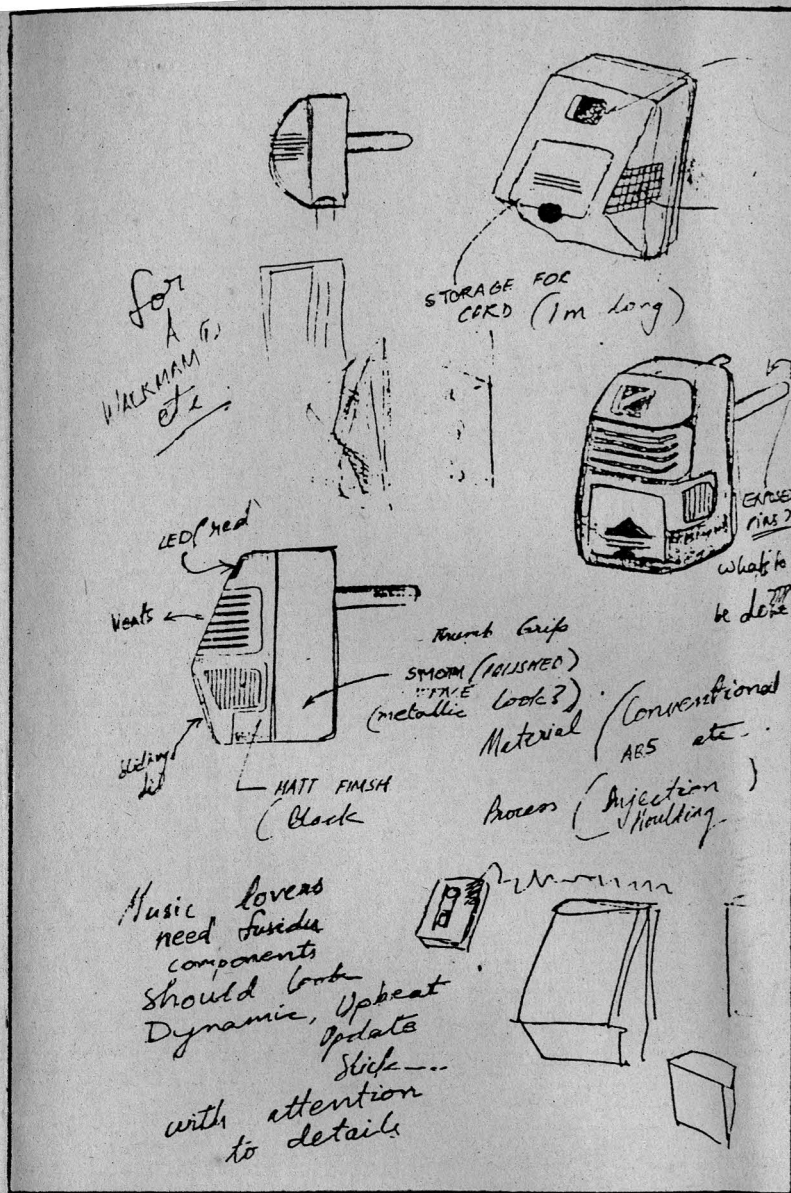


Fig 5.3 : Conceptualization :

Decision to go back to the idea in fig 5.1.

Exploration in terms of large radii to the edges but not satisfied.

came back to the same original idea and developed it further in terms of details, finishes, colours etc.

Decision on the user group and their requirements to reflect on the product took place.

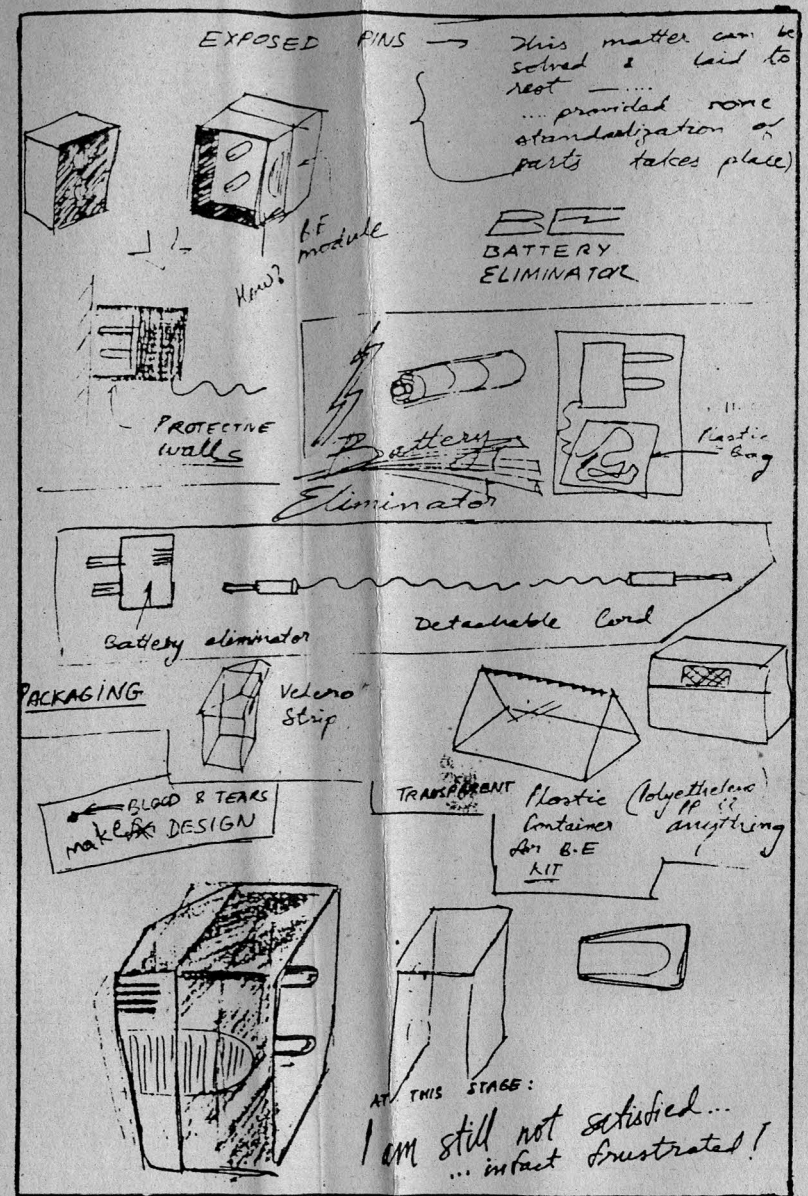


Fig 5.4

Departure from form development and exploration.

exploration of a functional problem, storage, packaging etc.

Expression of dissatisfaction over this idea.

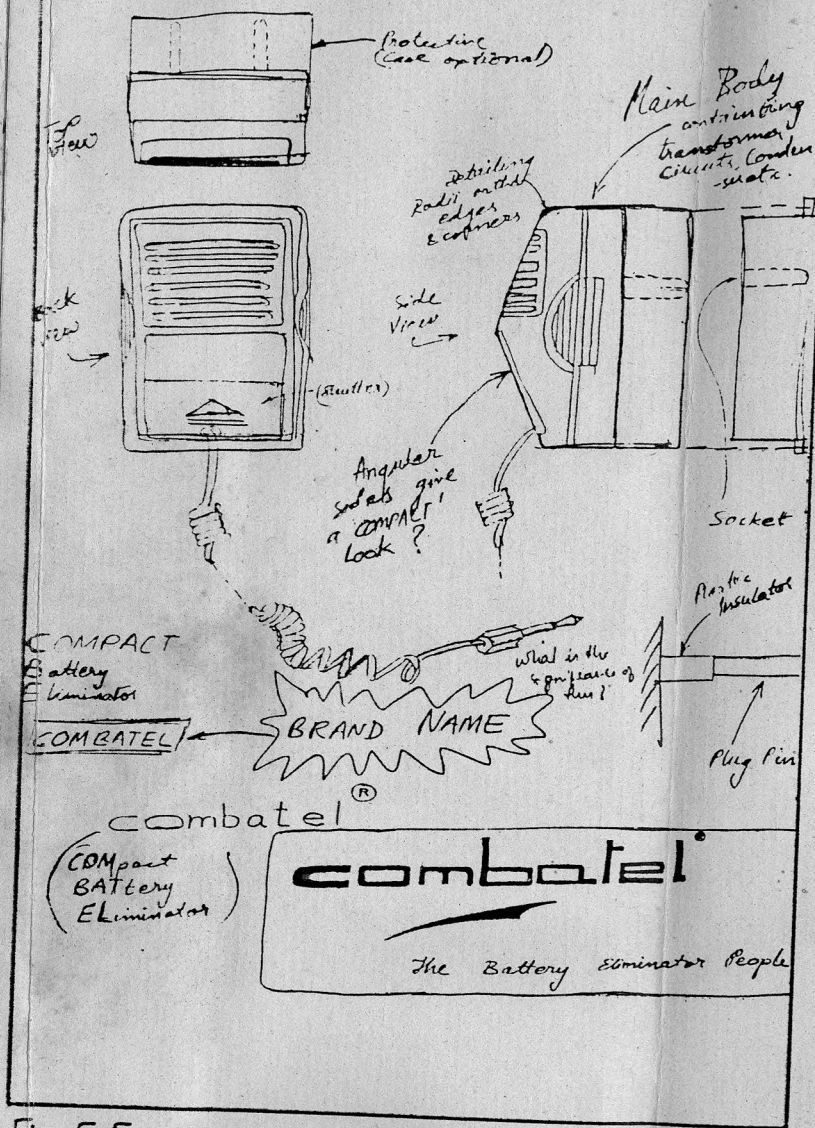


Fig 5.5
Jump back to concept 1.

Decisions of the functions, and development of details, supported by plan, elevation and side view sketches.
Decision on the brand name.

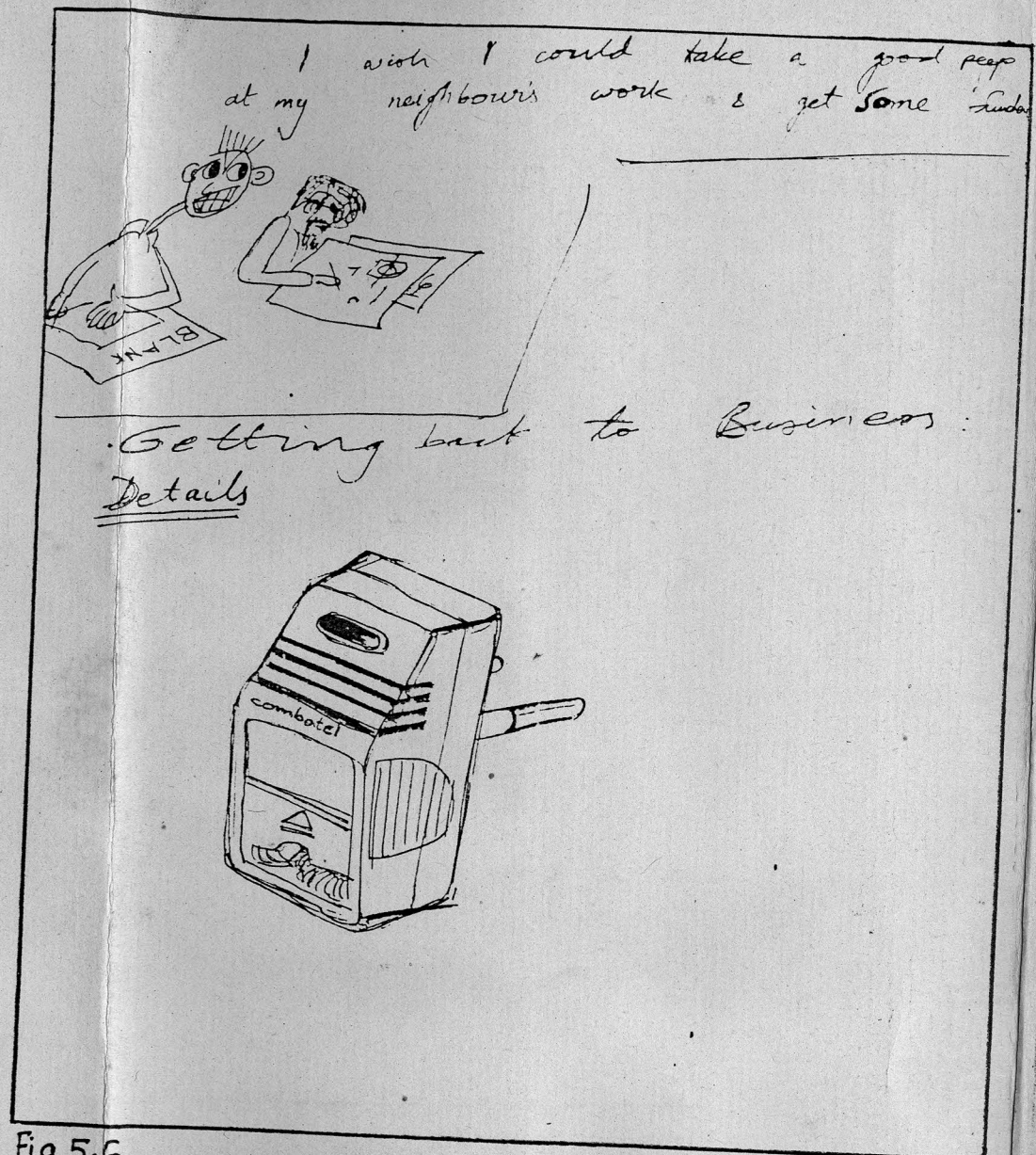


Fig 5.6

The final solution complete with all the details & graphics which formed a basis for model making, which was continuously referred to during model making.

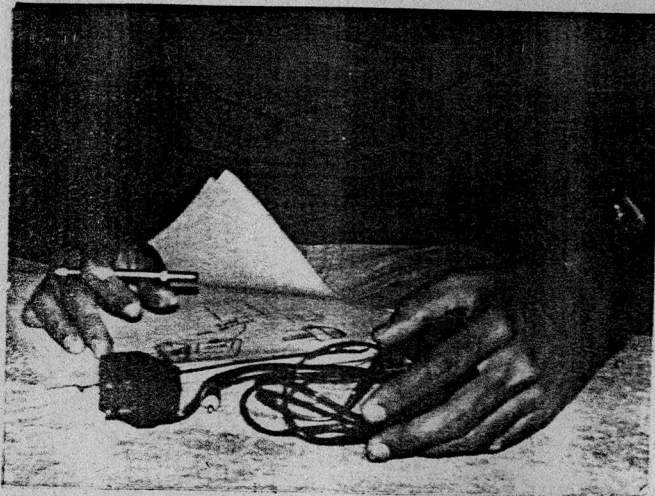


Fig 5.7
sketching process during which an existing
battery eliminator is used as a reference.



Fig 5.8
Model making stage where the sketch (final)
is referred to continuously. Details given by
a sketch pen onto the thermocole model.



Fig 5.9
Final touches being given. Brand name
"Combatel".

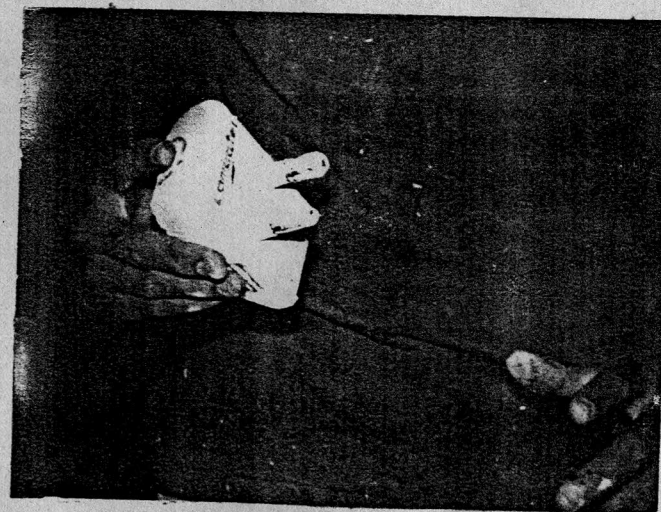


Fig 5.10
The final thermocole model which is an
exact 3D replica of the final solution drawn
(2D).

OBSERVATIONS AND COMMENTS :

This student sketched out the inner components at the beginning just to be aware of the each component size.

Use of various forms/sketches as clues to develop a concept.

Use of a basic building block for the first sketch, but use of developmental sketches while deciding.

Developed one form completely including details of grill, grip etc., and tried to go away from it but kept coming back and drawing the same sketch.

He tried to sketch out other details like storage of cord, packaging, brand name etc. as an excuse to move away from the problem and think of the form.

Only after deciding on a particular form, decided on the environment and then the graphics, colours, finishes etc. to match it.

Developed one final sketch complete with details and referred to this while model making.

Used thermocole to make a model.

NAME : GOKUL KRISHNA

AGE : 23 Years

STATUS : STUDENT - Junior Product Designer
(1 year design experience)

PREVIOUS QUALIFICATION : Electrical & Electronics
Engineer

Following is the photo documentation of the
sequence followed by this student while
he designed a BATTERY ELIMINATOR

Total time taken : 3 hours

Effective working time: 2 hours.

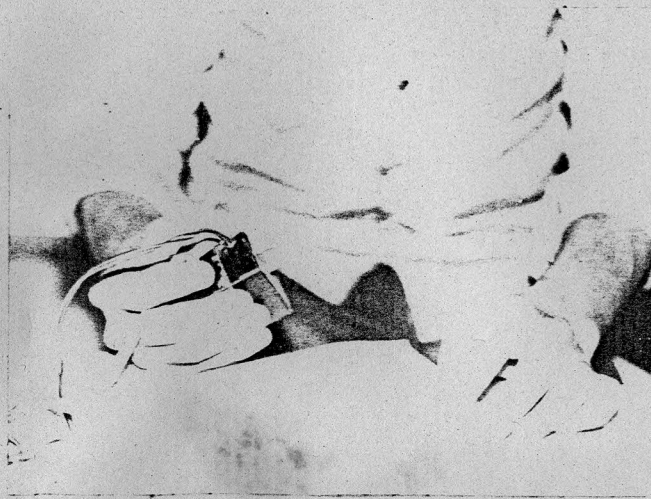


Fig 6.1

Sketching out the various concepts. Referring to an existing product during the conceptualization process.



Fig 6.3

Sketching session completed after a solution was arrived at. Thermocole block as the starting point for model making. The final design's sketch used as reference.

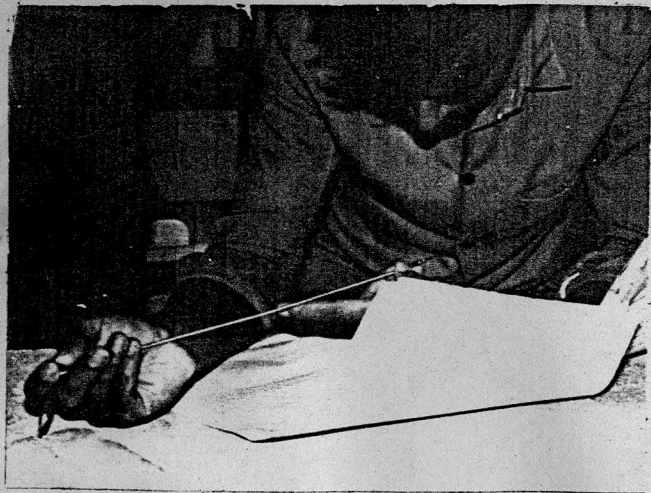


Fig 6.2

Taking a break from the problem. Studying a cable release of the camera.

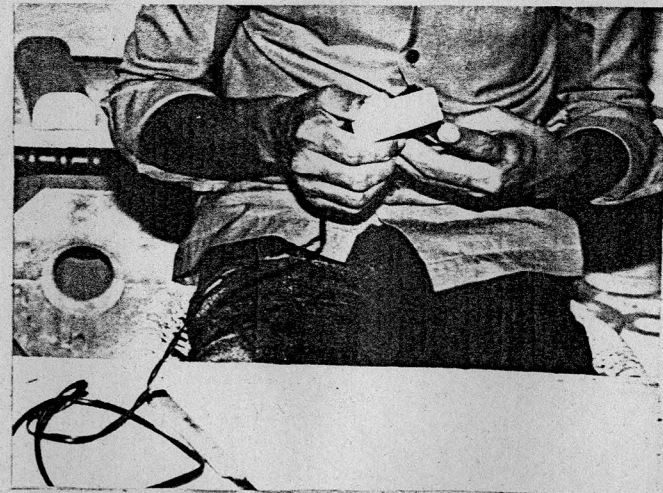


Fig 6.4

Removal of material to facilitate a thumb grip. This is being compared to the existing product to go further.

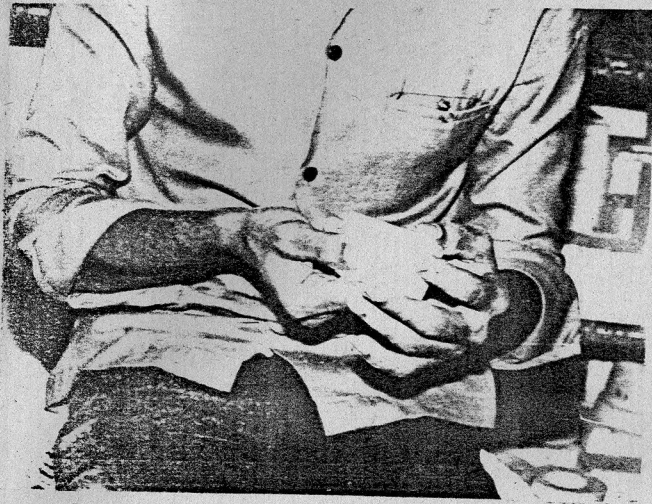


Fig 6.5

Testing the dimensions & location of the thumb grip by actually feeling it and touching it. This helped in taking other decisions of the form like grooves, details etc.

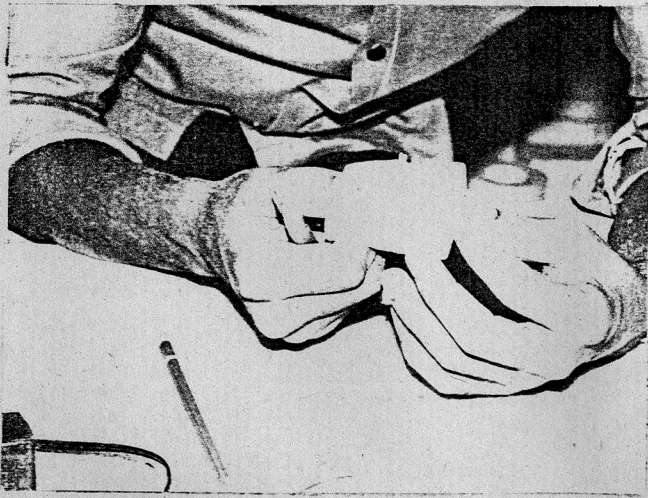


Fig 6.6

Removal of material to make grooves on the edges to accommodate the cord winding.

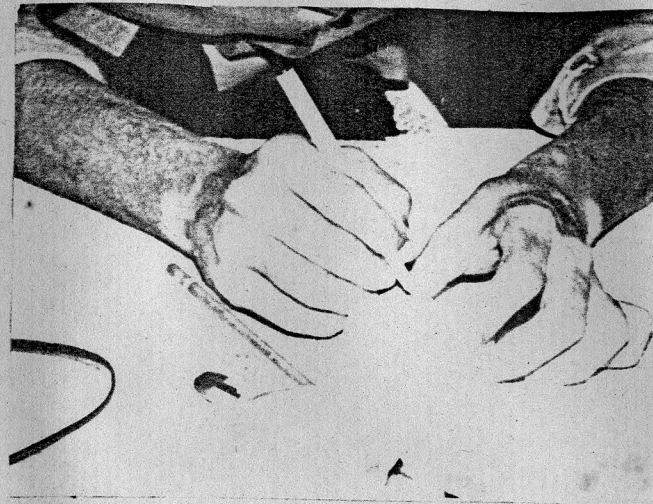


Fig 6.7.

Using 2D sketches on this 3D model to illustrate controls, graphics related to it.

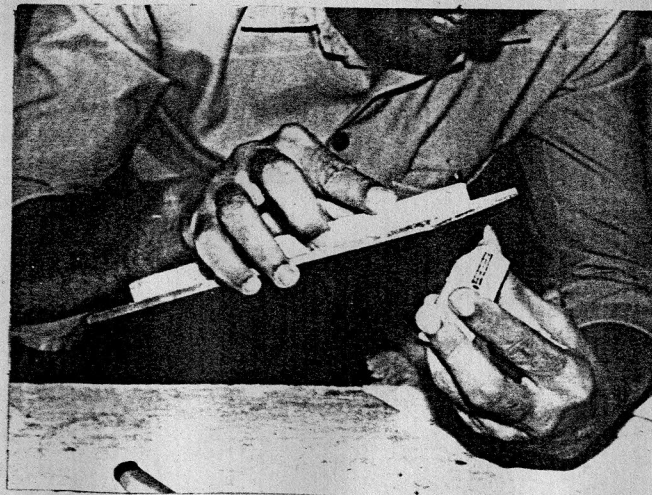


Fig 6.8

Sanding a side to give a chamfer. This decision came after visually examining the model from all sides.



Fig 6.9

Working on the details to pass time and be done next.

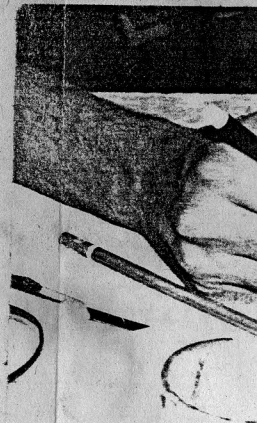


Fig 6.10

Details of the air sketched out on +

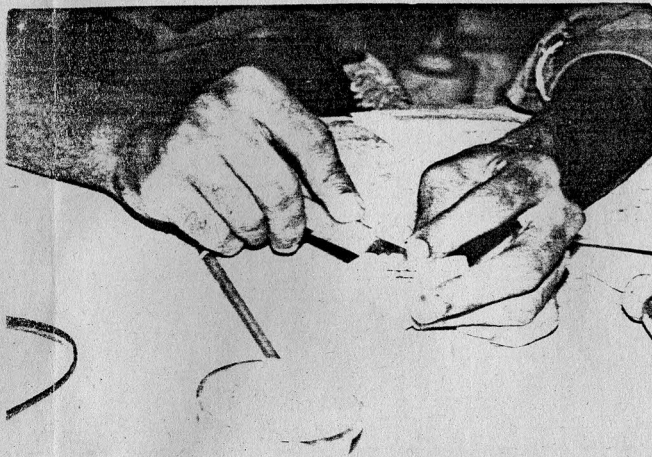


Fig 6.9

Working on the grooves over the sides, again to pass time and think about what has to be done next.

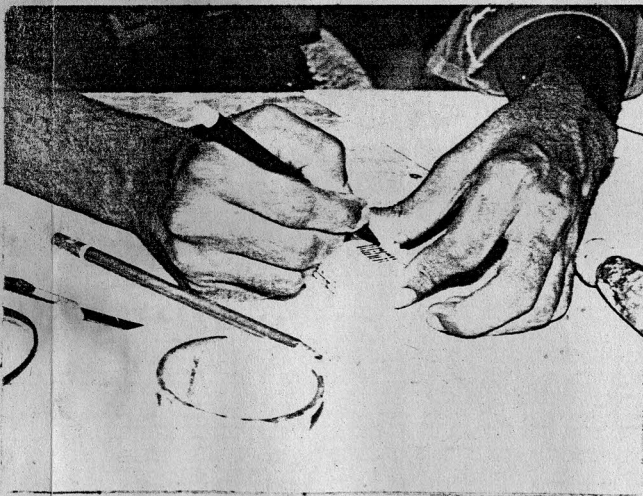


Fig 6.10

Details of the air vents - (their location) is sketched out on the top, bottom and sides.

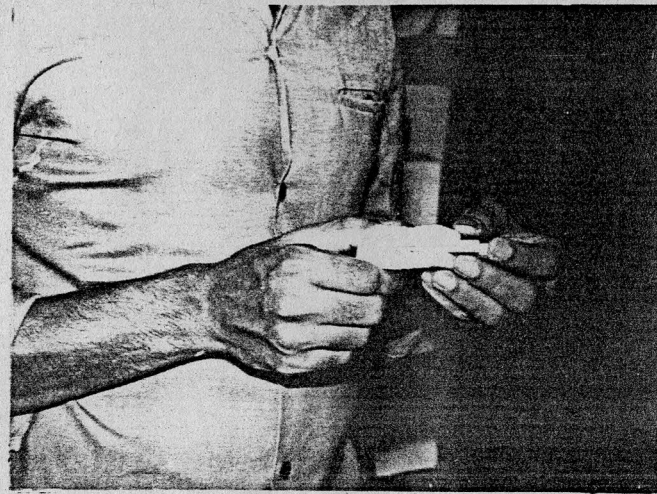


Fig 6.11

Using styrene rods to represent pins. The model is nearly ready. The thumb grip indicates how the product has to be held & used.

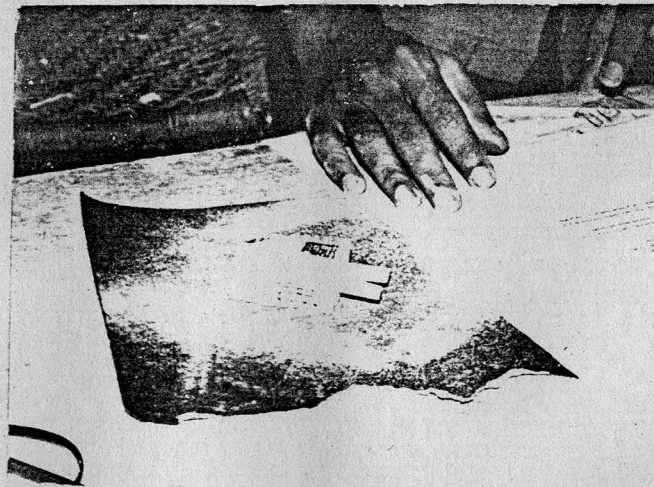


Fig 6.12.

The complete model with all the details of control switches, air vents, grooves, pins etc. This is a 1:1 scale model.

NAME : DEBASHISH MANDAL
AGE : 24 years
STATUS : STUDENT - Junior Product Designer
(1 year design experience)

PREVIOUS QUALIFICATION : Mechanical Engineer
One year work experience as Technical Design Engineer.

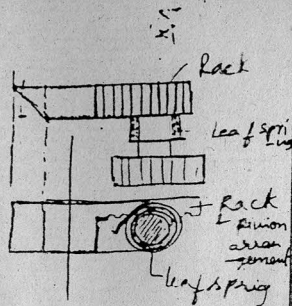
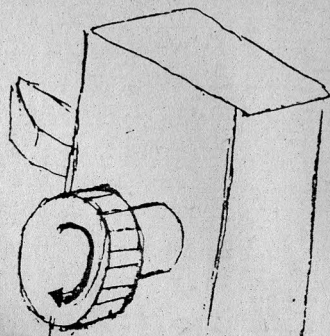
Following is the documentation of the sequence followed by this student to design a DOOR KNOB.

This was recorded on video.

Total time taken : 1.5 hours
Effective working time: 1.5 hours.

DOOR KNOBS FOR MUSEUM

Twist Type:



The door is assumed to have a door closer. When the knob is rotated clockwise direction, the lever is pushed out of engagement. Then push the door to enter. So after entering the door automatic closer because of the door closer. While closing the cam surface on the lever slides on its counter part and comes to its original position because of the leaf spring being in tension.

PUSH TYPE:



Here the letter 'P' has been used

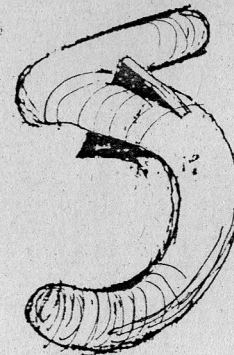
③ The handle has been provided a curved profile because generally when we push a member bends outward from the body. The word 'PUSH' can be engraved & embossed for a better communication.

PULL TYPE

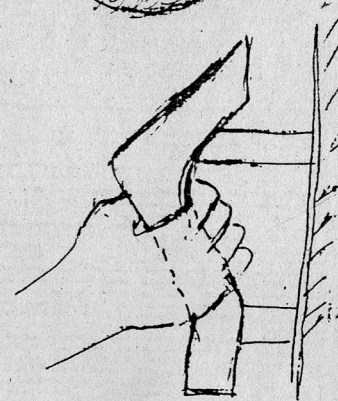
Same as the push type can be applied but the profile instead of being concave should be convex. This is because when we pull a member bends towards the body. This helps in getting the feel of pull.

Forms can be used to communicate the method of operation i.e. whether to rotate, in pull etc.

(1)



Like here the arrow has been integrated with the form to communicate the direction of rotation i.e. clockwise direction.



Handle made in the form of arrow pointing outward which shows it has to be pulled.

Fig 7.1: Preconcept level & Conceptualization:

Decision on environment for designing the knob.
Decision on choosing twist type of mechanism as basis.
This was developed further into a different door opening mechanism.

communication of push/pull as key design factor.

Concept 1: Graphic communication as well as reference to body movements for developing the form of the handle.
Mechanism location position not mentioned.

Fig 7.2: Concept 2:

Pull type-which came after developing the push type & is almost similar to it.

Concept 3:

choice of forms to communicate method of operation.
Strong emphasis on direction of rotation by integrating an arrow into the form.

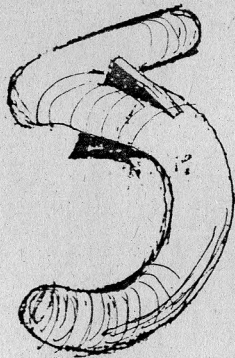
Concepts had the arrow as the main basis to develop forms. A hand indicates the right way of holding it - to make the concept understandable.

PULL TYPE

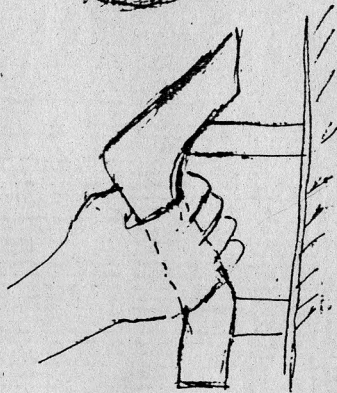
Same as the push type can be applied but the profile instead of being concave should be convex. This is because when we pull a member bends towards the body. This helps in getting the feel of pull.

Forms can be used to communicate the method of operation i.e. whether to rotate, in pull etc.

(1)



Like here the arrow has been integrated with the form to communicate the direction of rotation i.e. clockwise direction.



Handle made in the form of arrow pointing outward which shows it has to be pulled.

Fig 7.2 : Concept 2 :

Pull type-which came after developing the push type & is almost similar to it.

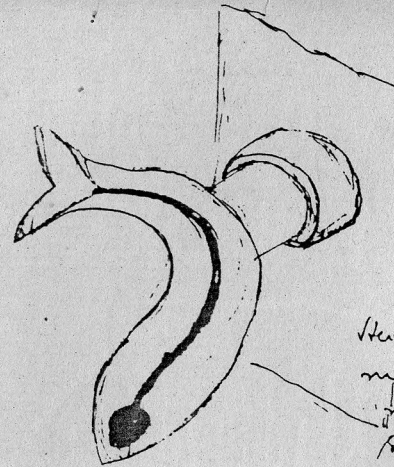
Concept 3 :

Choice of forms to communicate method of operation.

Strong emphasis on direction of rotation by integrating an arrow into the form.

Concepts had the arrow as the main basis to develop forms.

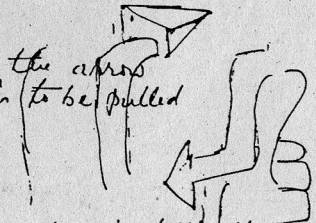
A hand indicates the right way of holding it - to make the concept understandable.



The fish is taken as a metaphor to show dynamism and bend posture shows the direction of the motion. Also it would go into the museum already surrounding. This is a rotatory type of door knob. The mechanism can be like the first type.

The model Model

In the thermocole model the arrow head shows that it is to be pulled outward.



NOTE: I find continuously working is difficult to get more ideas. I must get intervals to arrive at different concepts. I must be free to move around also.

Fig 7.3

Use of a metaphor to develop a form which indicated dynamism as well as the chosen environment.

Use of model making to generate further concepts.

This student expressed a wish to be free to move around for better thought flow.

OBSERVATIONS AND COMMENTS :

This student decided on an environment and a mechanism at the starting point. Looked at the sample handle provided and tried to understand the mechanism. Developed a mechanism which had its origin from one which he had seen earlier. He always used the right hand side of the page to doodle a bit, and only when the idea was clear, he would make a neat sketch and write about the origin of the concept and its purpose.

Communication of pulling/pushing the door- key design factor which he achieved through graphics, symbolic expressions metaphors and forms.

Use of model making to pass time, and also to try and develop new concept.

While making model, interacted with the grip and its surface to decide on the dimensions, chamfers etc.

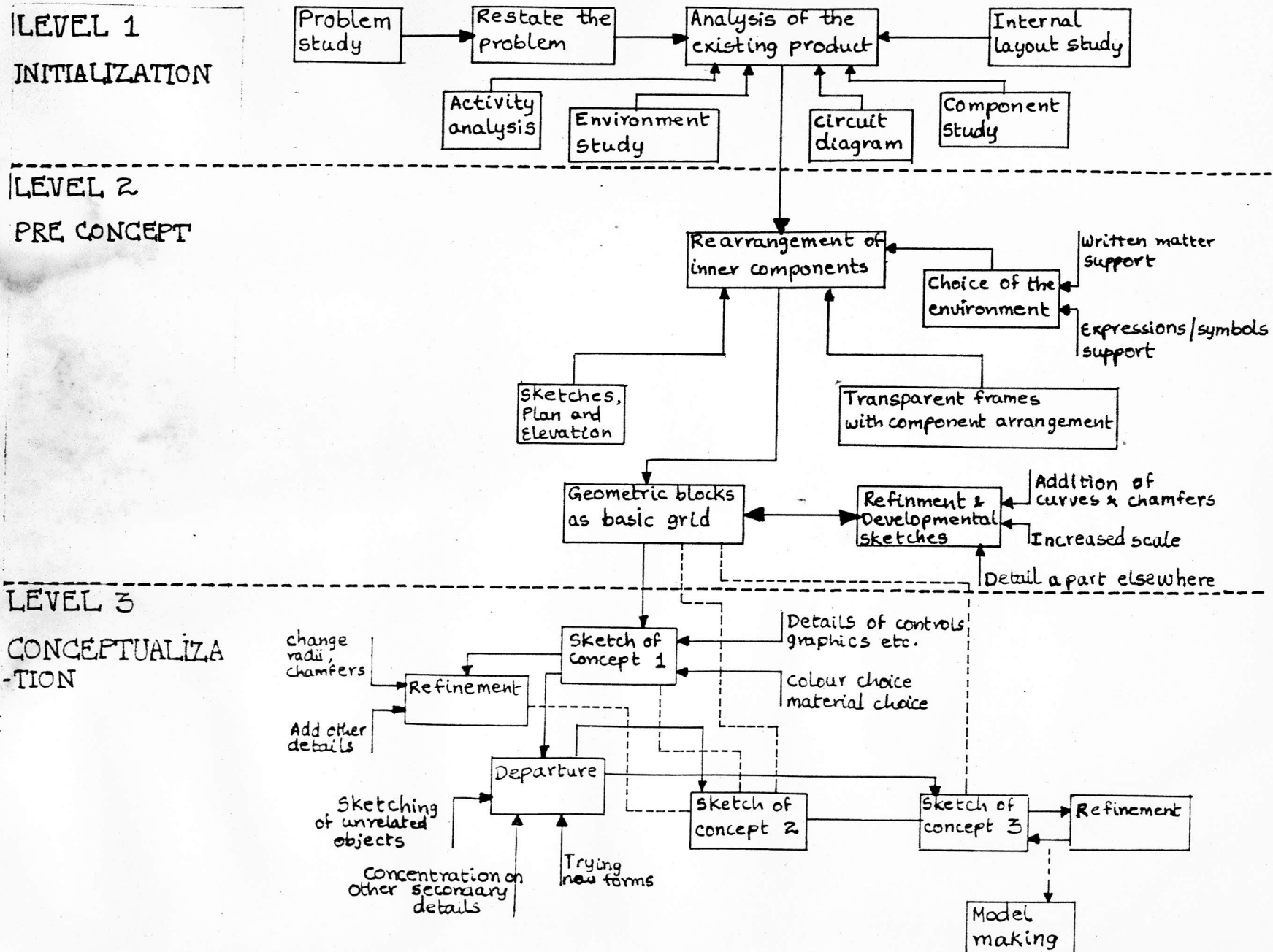
Finds continuous working difficult and expresses a wish to get intervals to arrive at different concepts.

Expresses a need to move around the work spot, freely.

6. GENERALISED OBSERVATIONS

6. GENERALIZED OBSERVATIONS

The basic structure followed by most of the students could be structured like this:



7. PARTICULAR OBSERVATIONS

7. PARTICULAR OBSERVATIONS :

Identification
examples
where most
evident ^{27.}

1. Internal arrangement not very important, only knowledge (size, no. of elements) of the particular components important. Fig.(2.1)
2. Use of a key element or expression and building the product around it. Fig.(1.3)
3. Starting directly with sketches of concepts without any other preparatory work. Fig.(2.1)
4. Use of individual geometric blocks to build the form Fig.(2.1)
5. Use of overlay method to refine sketches Fig.(2.1)
6. Drawing in 1:1 scale or 2:1 scale for details Fig.(5.1)
7. Path patterns of sketches
 - a) St. line
 - b) Zig zag
 - c) Random
 Fig.(4.9)
8. Order of sketching - (a) outline first and then the details
(b) details drawn separately Fig.(5.3)
9. Jumps and Departures : Most of the students showed this tendency of trying to go away from the problem either to an unrelated object study or product environment study. This was done either in terms of writing - about the problem, restating it, about constraints, goals, etc or by sketching, doodling. Some students felt that one was lost in the beginning and the only way to find one's way out is to start writing. Also these departures helped them to mull over it in mind to assess their own work. Fig.(4.3)
10. Decisions on colour schemes, materials, manufacturing processes, finishes while refining a concept i.e. at a near finished level. Fig.(4.10)
11. While refining a sketch, shading, darkening a line done slowly, deliberately indicating some amount of decision making still going on in the mind. Fig.(3.2)
12. Preference to go away from the work table for a few minutes, to take a break, to look at other things. Fig.(7.3)

Identification
examples
where most
evident

13. Dimension shift : Almost all the subjects used 2D, 3D sketches interchangeably. Some stuck to making only 2D sketches Fig. (1.3) plans, elevations through out. Some worked only in terms of 3D (orthographic) sketches.
(The preference was basically in terms of better visualization)
Some used 2D sketches initially and when clear about an idea, go over to 3D. Some in the process of using 3D, suddenly move to sections, plans, elevation to explore details.

14. Model making :

- o Only one student felt it was easier to make 3D models of the concepts directly without any initial sketching. He felt this could give a better visualization of the concept and also help him to think about it and modify it.
- o Some students sketched out all the concepts and then evaluated them, selected one for model making.
- o Preference to make very rough sketches initially, choose one, refine it and only then make a model which would be the exact replica of the sketch.
- o Frequent references to the selected sketch during model making.
- o Sanding of surfaces, chamfers, radii ; These were felt, touched to take further decisions. Some students spent a lot of time sanding as if to pass time.
- o Some went down to model making as a strategy to get more ideas.

8. FUNCTIONS OF A FUTURISTIC MODEL

8. FUNCTIONS OF A FUTURISTIC MODEL :

The conception of such a futuristic Designer - aide-de computer came from the observations of the study, conducted. Some of its functions could be as follows:

- o There would be a twin screen work station and no longer a single screen terminal. Both these would be interconnected and one works like a main screen, and the second like an aide. The aide screen functions could be - (1) work as a scratch pad, for doodling rough sketching, which would all be automatically saved and recalled at any time. (2) It could also have an extensive data base which could store several existing forms, so a designer can call them one by one of several at a time and change/ manipulate the form layout etc. (3) It could also store images, environments, visual references which could be recalled for functional reference of just to search so it could trigger clues in the designer's mind. (4) Whenever data about the problem is logged in it could convert it to a questionnaire and keep throwing them to the designer at intervals. (5) During breaks, this data base could keep throwing unrelated forms, patterns, on to the screen which may evoke fresh ideas. It could also allow the person to read something or even listen to music.

There could be :

- o A pen which does iterative sketching especially while developing a form. These iterative movements will not get erased as the next movement comes on so there is a cumulative form development.
- o A system which allows overlay method of refining sketches where the screens underneath show the faint version of the previous sketches as a reference.
- o Different varieties of shading to represent and recognise a 3D sketch so that such a sketch could be converted to a 3D object easily.
- o A system which interactively helps in manipulating a 3D form, but only partially i.e. In an overall form some part could be defined as rigid, and the rest could be flexible so only this part could be worked on.
- o A system which allows 2D to 3D shift without too many commands, and also to show sections whenever possible.
- o A calligraphic pen which could help label, the sketches, stickers, graphics developed else where and glue it on the required surface. Even if the surface has a curvature or even if it is complicated, it could just follow the contours. A library of standard graphic symbols too could be stored.

- o There could be an electronic cube with lots of tools around and when operating one on the cube, it could simulate the actions of an actual tool working on a block and generate sound even, related to the type of material and surface of the cube. One could also see the tool in operation.
- o There could be textural tools on the computer which by means of shading simulate a rugged surface or a soft surface.

These conclusions are totally based on the observations of the design students work. May be if another study is done on professional designers with lots more design experience, there could be other interesting observations coming in. These conclusions may demand a lot of improvement of the computer technology, software etc., but one strongly believes all this would be possible in the near future.

BIBLIOGRAPHY

BIBLIOGRAPHY :

1. Ernest R. Tello - Between Man and Machine, BYTE, September 1988.
2. Gabriela Goldschmidt - Interpretation : its role in architechtrual designing, Design Studies, Vol 9, No.4, October 1988.
3. Gary R. Bertoline - Fundamentals of CAD. Galgotia Publications Pvt. Ltd., New Delhi, 1987.

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1987-89.

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