RANGE OF HANDLES FOR MORTISE LOCK

PRODUCT DESIGN
PROJECT III

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Submitted in the partial fulfillment of the requirements of the degree of

Masters of Design
In
Industrial Design

Industrial Design Center
Indian Institute of Technology Bombay
April 2007

APPROVAL SHEET

The Product Design Project III titled " **Range of Door Handles for Mortise Lock"** by

Rupesh Nath.U , 0 5 6 1 3 0 1 0 is approved as a partial fulfillment of the requirements for Post Graduate Degree in Industrial Design.

Project Guide :_____

Chairperson :_____

Internal Examiner :_____

External Examiner :_____

Date :_____

ACKNOWLEGMENT

With a sense of achievement and satisfaction, as I reflect upon my project activity, I am filled with a deep sense of gratitute towards the important few whose help and support was instrumental in the completion of my project.

I would like to take this oppurtunity to thank my guide Prof. B.K. Chakravarthy who encouraged and inspired me in undertaking this project. I thank him for all the support, guidance, cooperation and valuable advice throughtout the course of my project.

I wish to express my greatfulness to all my faculty for the enthusiasm, knowledge and energy they gave during my course M.Des. I thank my department Industrial Design Center for providing me with wonderful facilities during the course of my project development.

I would like to thank Godrej and Boyce Mfg. Co. Ltd., Mumbai for their timely support and feedback throught out the project. Apart from this I would like to thank G.E. Plastics, Mumbai and also Techno Print, Mumbai for their support and help given to me.

I would like to thank to Sunil (Senior), Sachin (VC) and Ashima (NID) for their help for photography and inputs during the study.

CONTENTS

INTRODUCTION

A lifestyle is the way a person (or group) lives. This includes patterns of social relations, consumption, entertainment, and dress. A lifestyle typically also reflects an individual's attitudes, values or worldview. Having a specific "lifestyle" can be described as patterns of behavior based on alternatives given and how easy it is to make this choice over others given. Life style product embodies the values and aspirations of a group or culture. A lifestyle product speaks the core identity of its customer. Individuals each have their own sense of self, based on their background.

Door lock and its handle is one the life style product which is the main line of defense that most people use to protect their valuables. The main reason we use locks everywhere is that they provide us with a sense of security. Before which if we consider door as a main protector which is the partition of two different spaces, then lock will be its weapon or accessory to support the door. Door is the main interface which will speaks about the room inside, what kind of lifestyle it has and lock handle is no exception. It has to go with the door form and aesthetics. Lock handle is the interactive zone, by using people push or pull the door. The main interaction is with our palm, which senses the material, form, feels the comfort, etc.

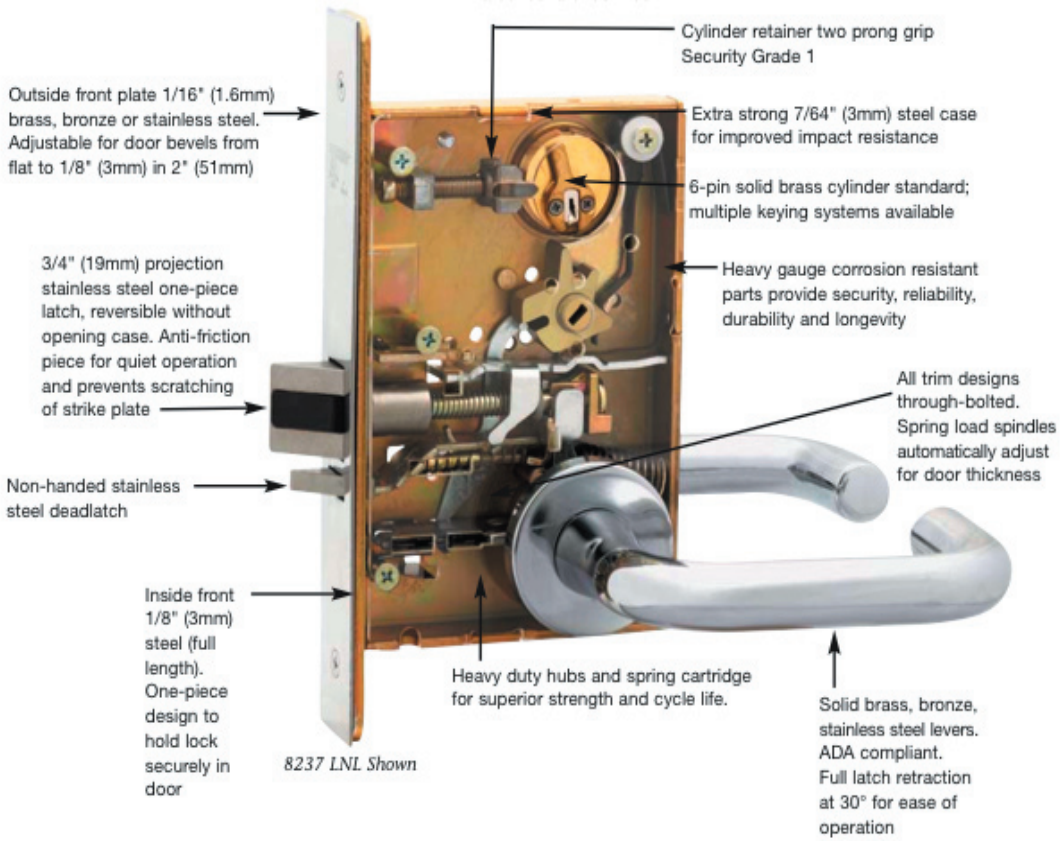
There are many designers who have tried to give their best to provide the above listed elements and have become successful. My project is one more attempt to enhance those parameters.

There are two main types of lock: the mortise lock, which fits into a slot in the edge of the door, and the rim lock, which fits on one face of the door.

A mortise lock is a locking mechanism with a large case that is installed in a door mortise. The mortise lock is generally more secure, but the convenience of the cylinder rim lock makes it probably the most widely used front door lock.

The standardized heavy steel case is smooth, easy to mortise and assures a snug and solid fit in the door mortise. Vital interior working parts are made of solid, hot forged brass or steel for a lifetime of trouble-free operation.

Mortise locks are supplied as either deadlocks, with a single rectangular bolt, or as sash locks, with a second spring loaded bolt. The latter can be used with a handles and will hold the door shut even when not locked. Detail Sectional view of mortise lock with handle is shown in the next page.



8237 LNL Shown

INTRODUCTION

This project is about the redesign of the form and aesthetics of mortise lock handle which is manufactured in India by M/s Godrej and Boyce. This project won't be dealing with the redesign of mortise lock and its mechanism.

The hand is one of the most delicate and complex parts of the human body. Therefore, it is not surprising that I am keen on designing an object, where form, substance, and function must correspond perfectly to the shape of the hand by facilitating its movement, without harming it. Each handle must radiate sensuality by sight and by touch.

Godrej, one of the largest business houses in India, has been continuously striving to offer locking solutions that reflect integrity, trust, quality and environment consciousness. Godrej Locks is looking for change in form, function and scope of application. Mortise door handle is one of the life style product which is having a good market, so they are looking for better forms and even better manufacturing processes.

Mortise door handles In Indian market as such is also being dominated by other manufactures like Dorset, Sergent, Swastik, Tiger and some other small manufacturers to compete with them should have equal or more positive points. These points which would define the sucess of the brand will include quality of the product acceptability i.e. its love at first sight appeal, but thankfully Godrej Locks has at par with its competitors by its quality and the brand.

Objective

To design a range of mortise lock handles focusing on aesthetic appeal.

It should be wide enough to accommodate aesthetic preferences of a wide variety of users.

Stage 1 Data Collection and Analysis

- Study of different mortise lock handles in Godrej and also handles made by other competitors.
- Study of Manufacturing processes followed in the company and by their vendors.
- Data regarding the constraints and possibilities.
- Inferences from the above data.

Stage 2 Ideation and Conceptualisation

- Initially some metaphors like peacock, leaf, etc were taken for generating ideas.
- Visual exercise with the subjects was done to get the visual clues.
- For some selected ideas exploratory models are made.
- Focusing on the key requirements, selected attributes like visual expressions and manufacturing processes, clustering method is used.
- For the back plate geometrical exploration is done to the match the form of the back plate with the handle.

Stage 3 Concepts Refinement

- Mockups for the initial concepts are made to know the actual size and to feel the form.
- 3D CAD models are made with refinements obtained from the above study.
- To enhance the aesthetic looks graphics on the handles is introduced.
- Visual Product Testing

Stage 4 Prototypes

- 1:1 scaled non working prototypes.

PRODUCT INFORMATION

This includes the study of Godrej Mortise lock handles and competitors products. The study is done in three different ways that is

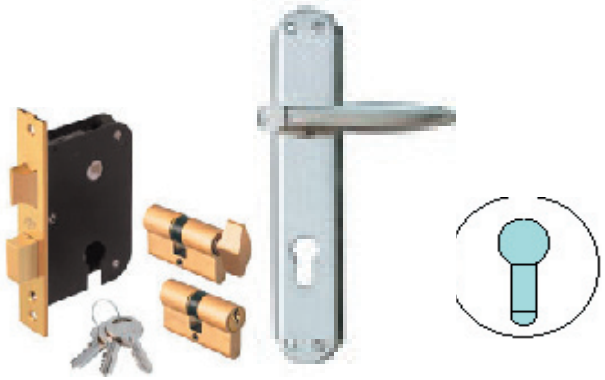
1. According to the type of lock

2. Form Study

3. Detailing

Type of Lock

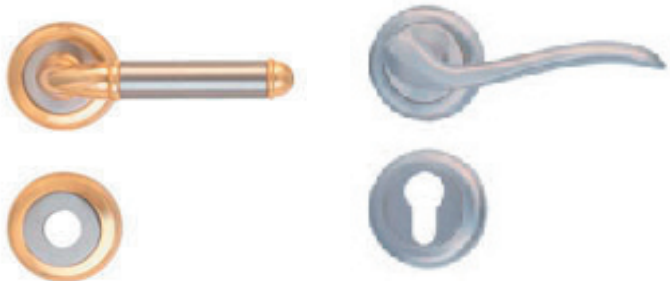
Combi pack for **Euro Profile** Mortise Lock



Combi pack for **Lever** Mortise Lock

Combi pack for **Ultra** Mortise Lock

Rose Set handles for Euro Profile and Ultra Mortise Lock



Combi pack for **Key less** Mortise Lock

The profile of the key hole is designed according to the type of lock. Interestingly it is observed that except one handle i.e., regal model (Top Center model), all other models are manufactured at different places by their vendors.

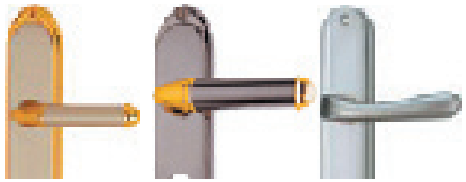
Form and Details of Godrej Handles

BACKPLATE

HANDLE

Straight Profile

DETAILS



- V, Semi circular, straight end profiles.
- Embosing is used to bring some cues or feature lines, even it is also tried to match the profile with type of detail.
- Engraving is used to bring richness in the handle.

- Detailing is mostly at the ends of the handle, may be because of human hand interaction at the center portion.
- Ends of Round handles are detailed with round knobs or rounded.
- Flat or elipse handle ends were bent inwards or downwards.
- Bi-metals are used to enhance the look.

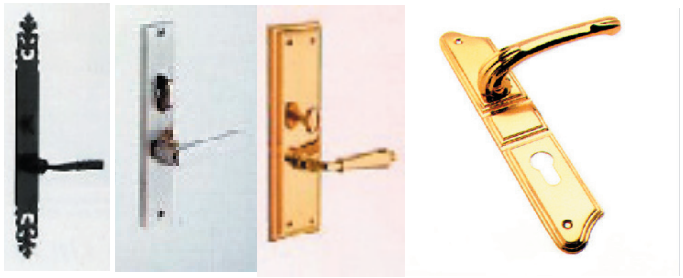
Curved Profile

- When the handle profile is not straight then mostly semicular end profile is used. Only one handle set is found straight end profile.
- Embossing is also used to enhance the form.

- Plane surfaces without any extra parts or engraving, even most of the backplates have only semicircular profile ends.

Form and Details of Other Companies Handles

BACKPLATE



HANDLE

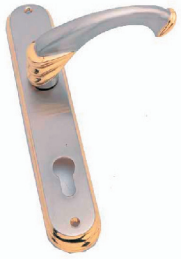
Straight Profile

DETAILS

- Mostly Straight end profiles are used when the handle is straight.
- Patterns are made with punched holes

- Inclusion of other materials is tried out in different ways.
- Not much detailing or engraving is done. Due to which elegance in the form is obtained

Curved Profile



- Curved profiles are used with some embosing, colors, etc.
- Mostly four screws are used when any embosing or engraved features are applied to get the balance.
- If backplate is engraved/embossed then it doesn't have any curved surface in the front.

- Engraving is used to enhance the richness
- In Western countries the lock hole position is on the top, in the user study it was also found that, keyhole is not visible when palm is on the handle.

MANUFACTURING DETAILS

The study has been done in the following ways

1. Parts, Materials and Manufacturer

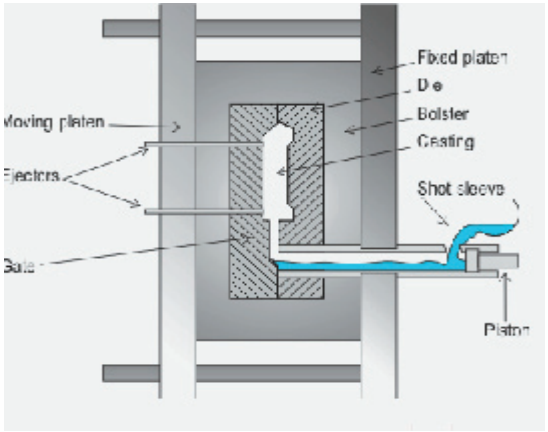
2. Study of manufacturing processes used by Godrej Locks

3. Finishes

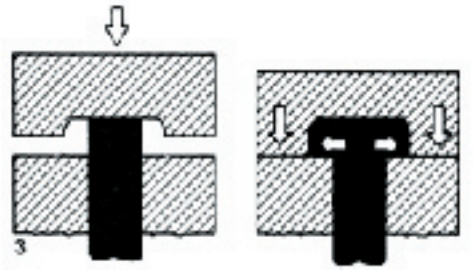
Combi Pack Mortise Handle

Part	Material	Manufacturer	Process
1. Handle	MAZAK	Inhouse Manufacturing	Die Casting / Forged
	Brass	Vendor	Die Casting / Forged
	Cast Iron	Vendor	Die Casting / Forged
2. Back Plate	MAZAK	Inhouse	Die Casting / Forged
	Brass	Vendor	Die Casting / Forged
	Cast Iron	Vendor	Die Casting / Forged
3. Spring	Spring Steel	Vendor	Extrusion and Spiral
4. Stopper	Hardend Steel	Vendor	Sheet metal blanking
5. Circlip	Spring Steel	Vendor	Sheet metal blanking

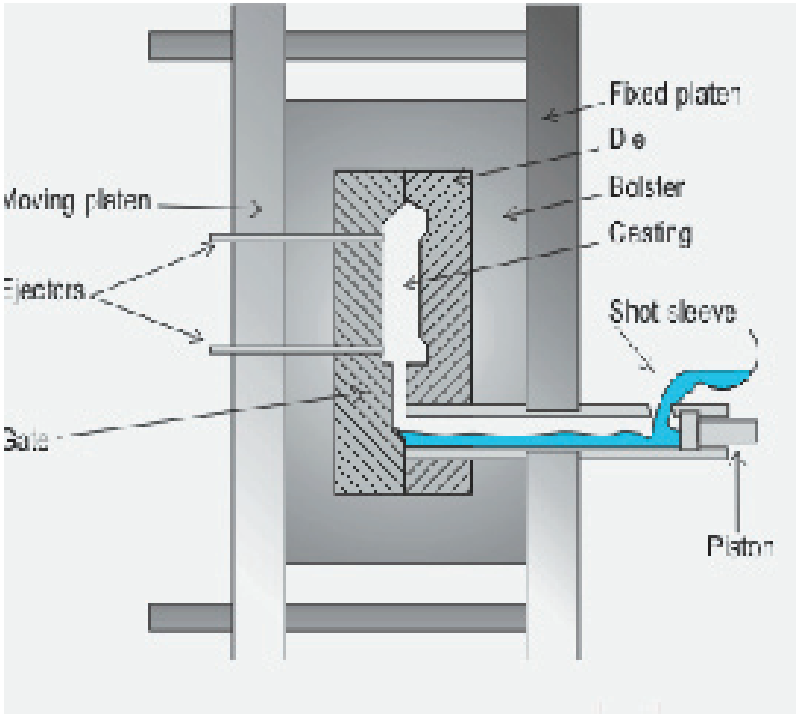
Die Casting

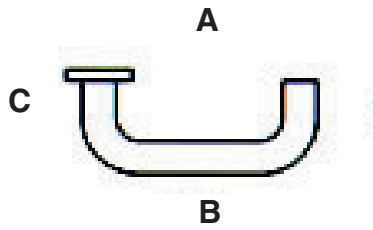


Forging



Die Casting





Top View of the Handle

Handle

Process -- Die Casting, hot molten metal is poured manually into the slot sleeve which flows into the die and cools inside.

Manufacturing Details :

Injection is done at fixed side and runner is also at the same side. Mould is on the moving side.

Injection from side A is not possible as mould and runner removal will be difficult for handles.

Injection from B is done when it is a single cavity mould and where precision is required.

Injection from side C is preferred if the mould is less complicated, here the productivity goes up.

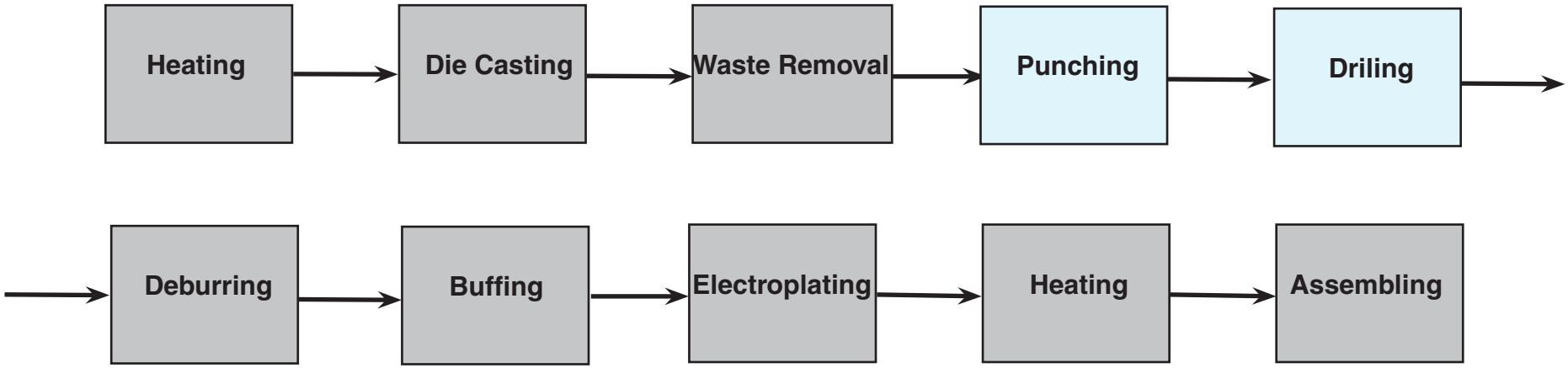
This is useful when one requires multi cavity moulding to take place i.e., more number of handles at a shot.

Disadvantages:

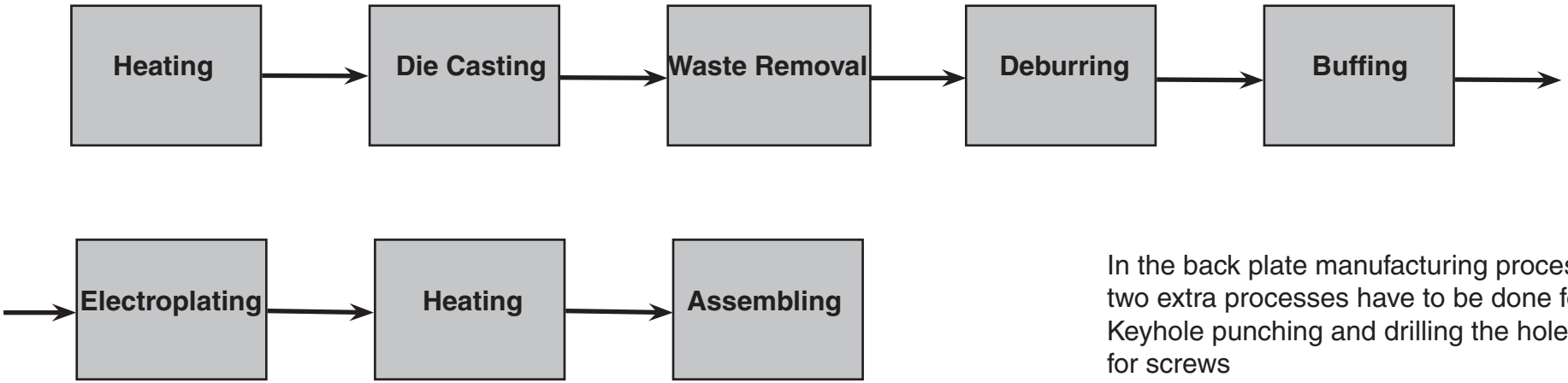
- Voids and Porosity is possible in complex shapes
- Expensive machinery and dies
- Limited to metals with low melting point (normally no higher than copper based alloys)
- Hollow sections are complicated

Manufacturing Flow Line

Back Plate

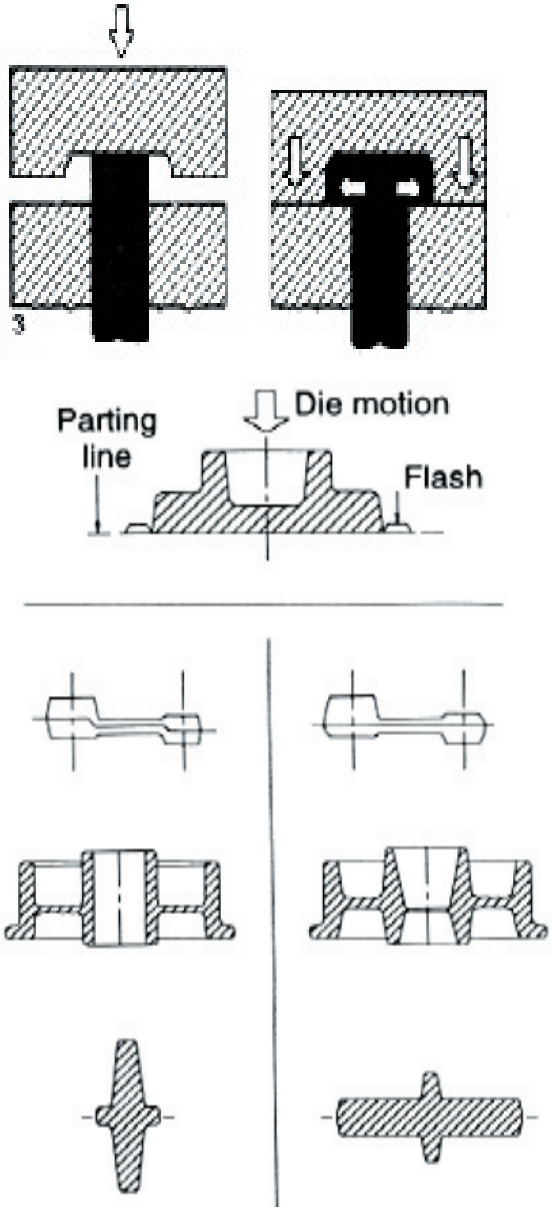


Handle



In the back plate manufacturing process two extra processes have to be done for Keyhole punching and drilling the holes for screws

Forging



Handle

Process -- Application of compressive force applied through various machanisms

Manufacturing Details :

The forming of workpieces through a succession of tools and dies. Improves properties as well as form a required shape, which produces discrete parts.

Capabilities:

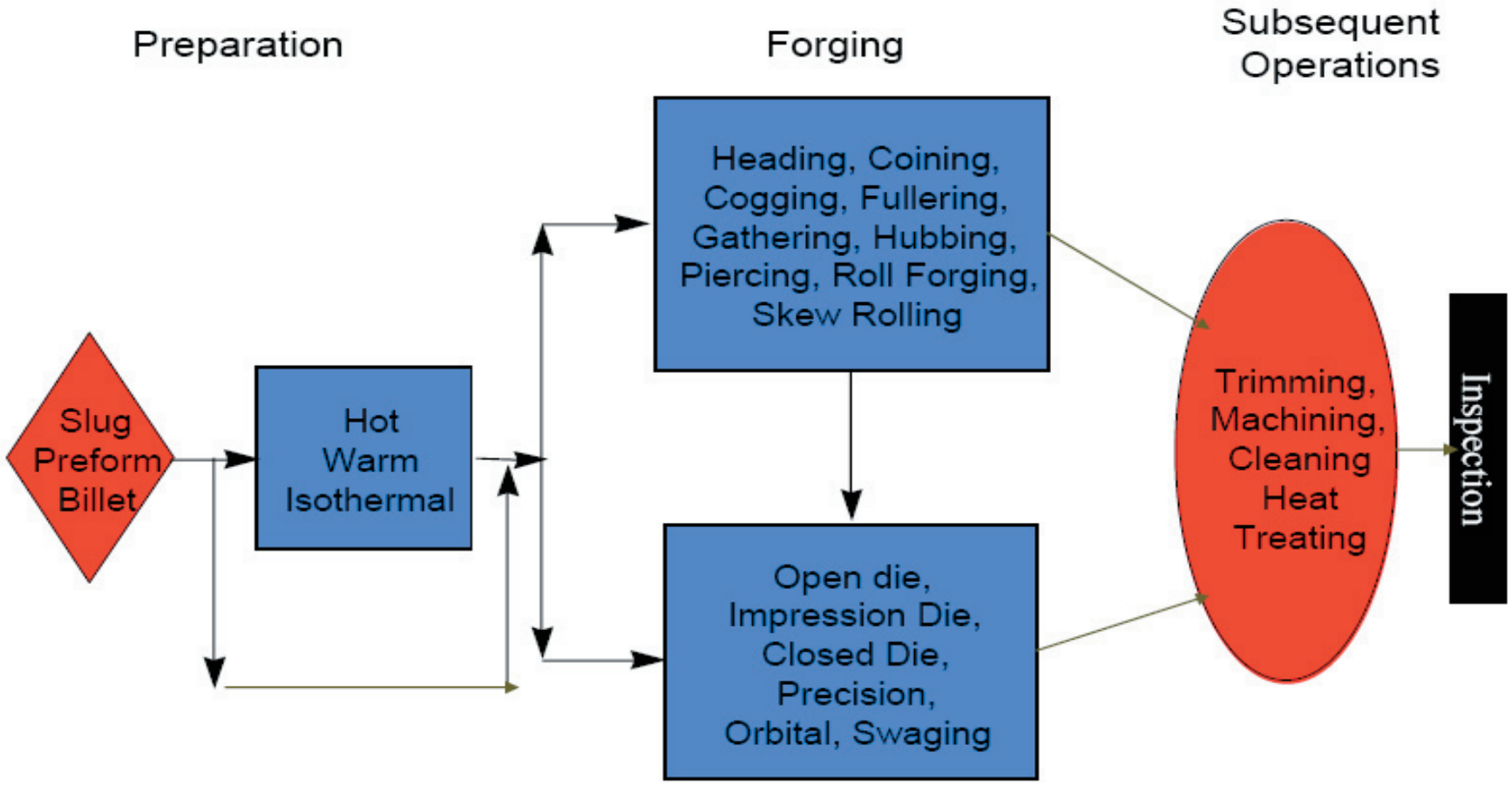
- Tolerances of 0.5% to 1% can be achieved.
- Material properties can be tailored by appropriate die design, ie. directed material flow
- Parts of reasonable complexity can be created

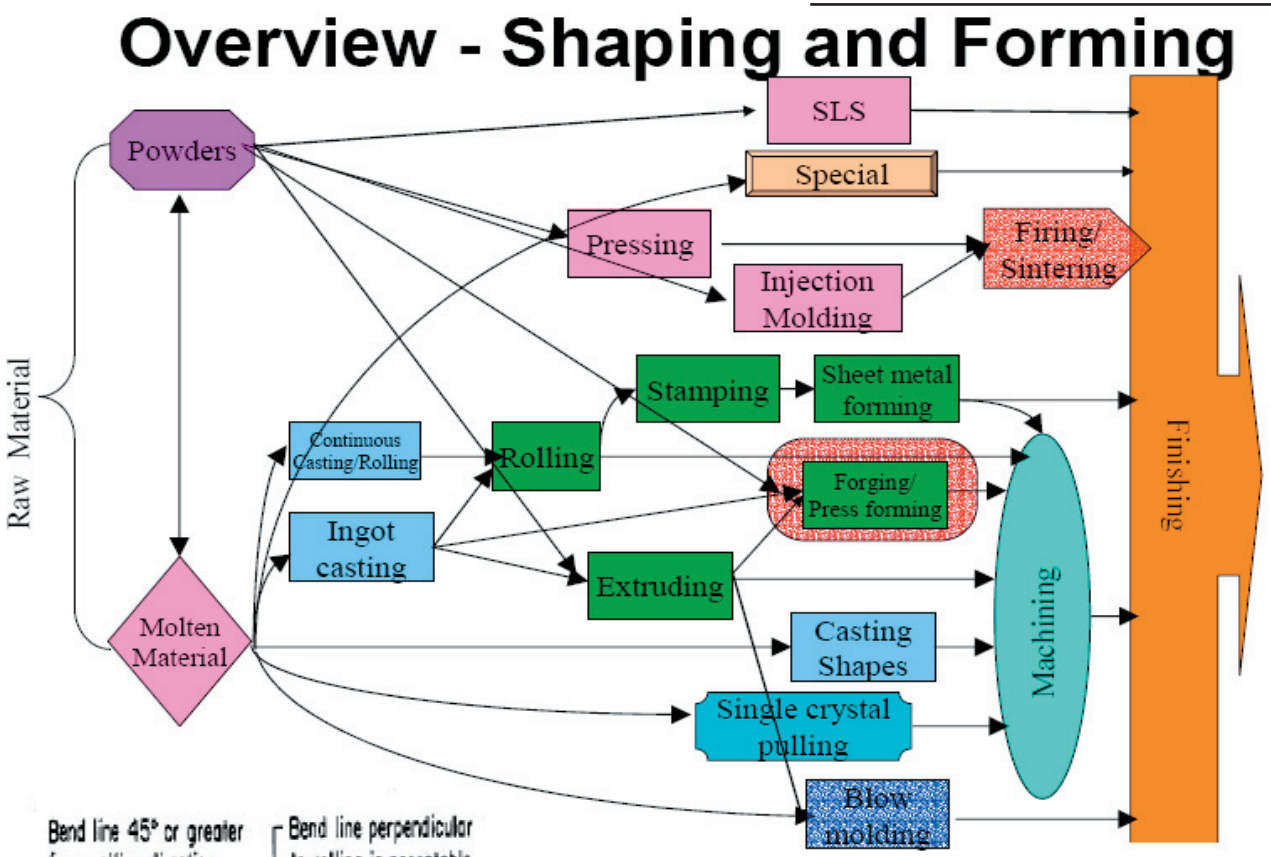
Disadvantages:

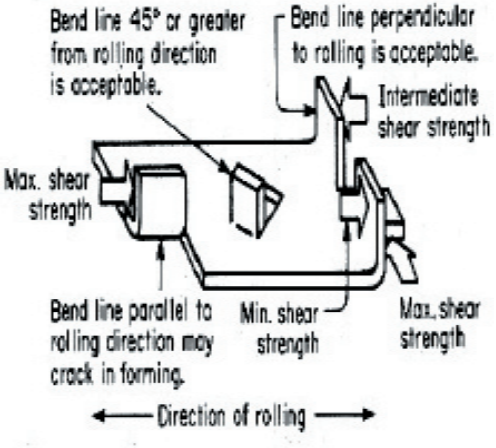
- Dies are expensive, particularly for hot forging
- Highly skilled labour required
- Rapid Oxidation happens

Suggestions:
- Choose parting lines such that the part lies entirely in one die half
- Avoid non-planar lines
- Provide tapers
- Locate parting line so that metal will flow parallel to the parting line
- Avoid excessively thin sections

Forging Process Categories







In metal forming processes the material is shaped using physical force.

Typical characteristics for metal forming is relatively high tooling investment, high production volumes, medium geometric flexibility and very little material waste. Parts produced by some of the metal forming processes (e.g. forging) are just like casting processes and powder processes called net-shape processes since they produce parts with the (almost) final geometry.

- Part Design can improve material utilisation
- By careful layouting part design can be improved
- Combine parts (One inside the other) will also improves material utilisation
- Light weight products can be obtained
- Versitile shapes are obtained

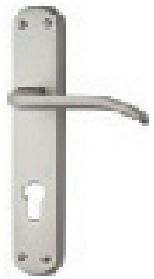
Mainly below two classications can be used for manufacturing process of handle

Solid Metal Forming → Forging, Extrusion

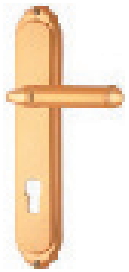
Sheet Metal Forming → Bending, Rolling, Deep Drawing, Super Plastic forming

Existing Finishes on the Handles

Pure finishes

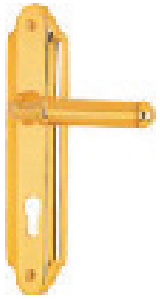

Matt Satin

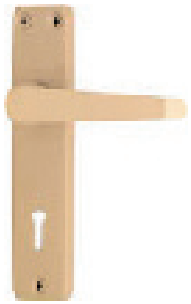

Gold


Pearl Gold


Royal Gold


Chrome


Brass

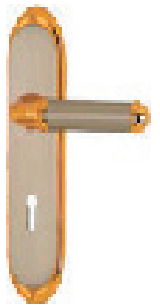

Beige


Brown

Combination Finishes

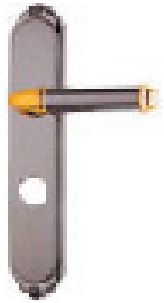

Satin-Chrome

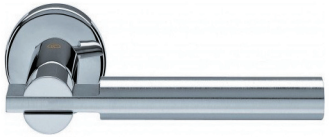

Polished Brass


Satin – Gold


Satin-Nickel


Satin-Brass


Black – Gold


Polished Chrome


Brushed Nickel


Antique Brass

Existing Finishes on the Handles

Venetian Bronze

Oil Rubbed Bronze

Distressed Brass

Antique Copper

New Types of Finishes

Chrome-White Enamel

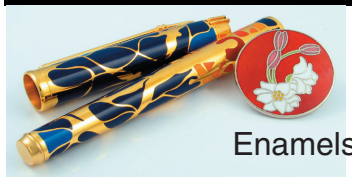
Antique Nickel / Pewter

Satin Black

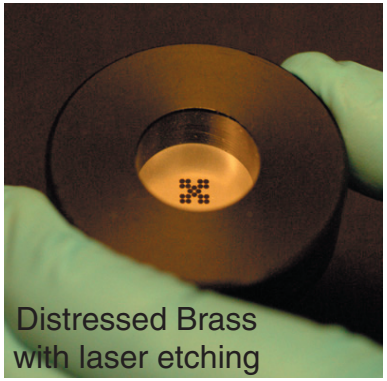
Distressed Oil rubbed Bronze

Antique Nickel

Available additional finishes



Enamels



Distressed Brass with laser etching

Stainless steel with Titanium coating

Titanium Nitride Coating

Finishes by Other Meterials and Processes

GE PLASTICS

Lexan Resin

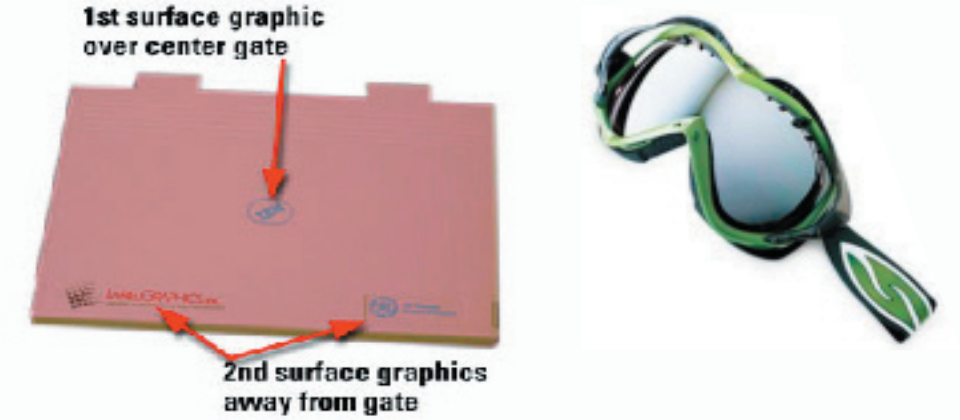
Lexan polycarbonate (PC) and PC-based resins offer impact resistance, outstanding dimensional stability and crystal clarity. Lexan resin is an amorphous engineering thermoplastic with high mechanical, optical, electrical and thermal properties.Lexan resin is available with a wide variety of additives, such as UV stabilizers and mold release agents. Grades include FDA-compliant, flame retardant, high flow, and glass reinforced.

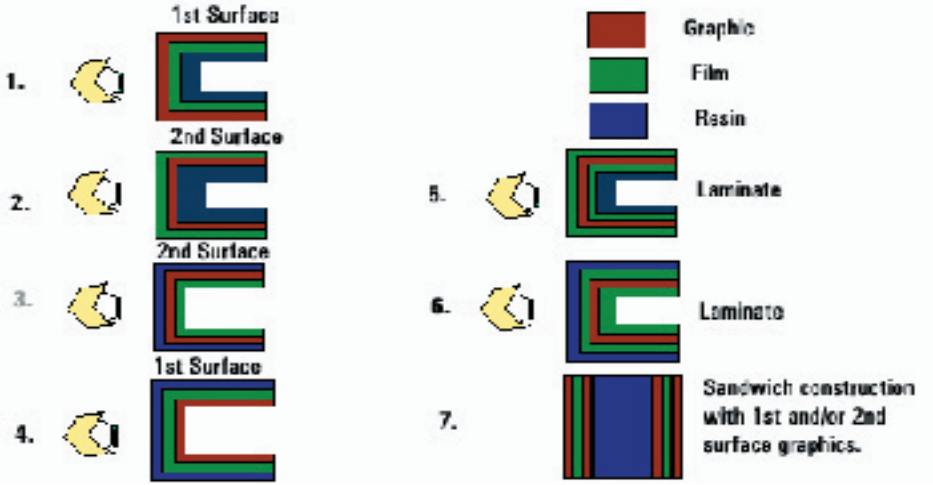
PC ABS resins are a blend of polycarbonate and acrylonitrile butadiene styrene yielding high strength and high flow for thinwall molding.

Cycoloy polycarbonate/acrylonitrile-butadiene-styrene (PC/ABS) high impact amorphous thermoplastic blends combine ease of processing with low-temperature ductility. With excellent impact resistance, heat resistance, and outstanding aesthetics, Cycoloy resin blends can be tailored to meet specific property requirements, to help balance performance, cost and processability.Cycoloy resin blends provide an excellent design solution when both appearance and durability are important.

The above suggested materials can be used for accessories of the handle like cover plate for covering screws even, some part of the handle can be plastic which will lead to some more aesthetic looks. Even if the handle is made in plastic then the above material is good enough to take loads, wearability problems etc., as specified above.

Finishes by Other Meterials and Processes





GE PLASTICS

In-Mould Decoration

IMD offers many design flexibility and productivity advantages versus other decoration methods done after molding. These benefits include design flexibility; multiple colors, effects, and textures with a single operation; long-lasting graphics manufacturing productivity; and systems cost reductions.

“Life-lasting” graphics are encapsulated between film and resin with IMD. Unlike traditional 1st surface graphics that can wear off, 2nd surface IMD graphics can not be removed without destroying the part.

Manufacturing gains can include:
- Reduced secondary operations and labor
- Production that molds and decorates in one operation
- Elimination of adhesive (cost and process)
- Lower system costs in many applications
- Reduced inventory with capability to stock only one color of resin.

Finishes by Other Meterials and Processes

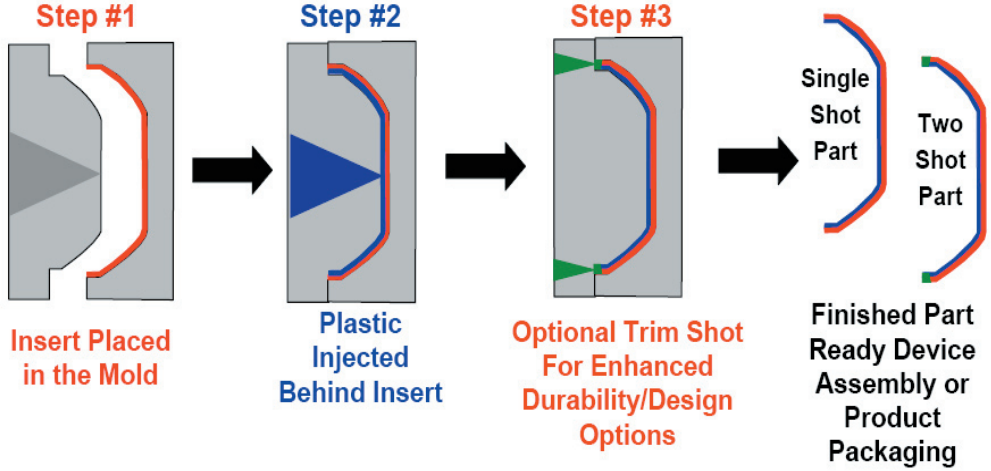
Leather

Fabric

Custom Style

EXO™ Overmolding Process

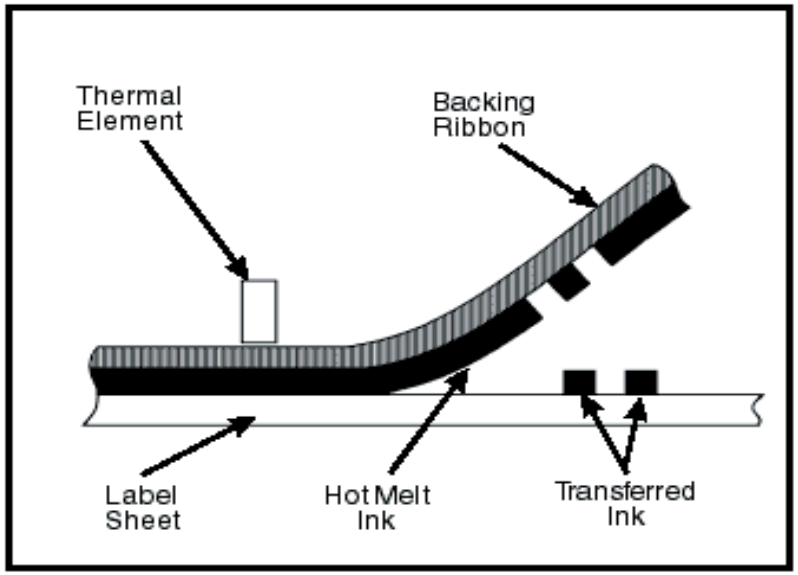
INCLOSIA SOLUTIONS



Design Flexibility

The EXO process has built-in design flexibility that offers a wealth of options in geometry, size, dimensions, form factors, layout, etc. The flexibility includes:

– deep draw
– holes and pockets
– 3-D shapes
– logos and emblems
– embossing and debossing
– printing and laser etching
– mixed materials
– integrated fasteners

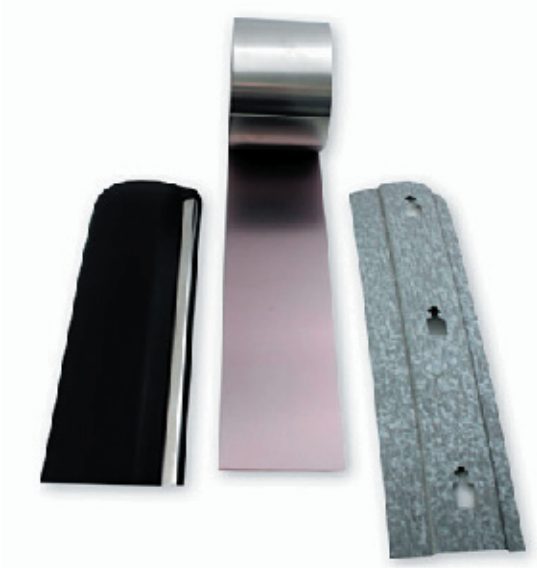


Thermal Transfer Printing

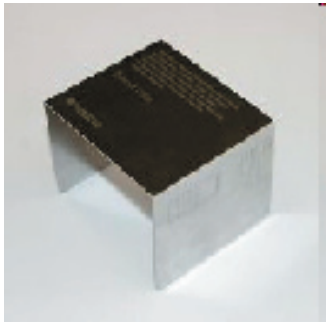
TECHNO PRINTS, Mumbai

Heat Transfer Printing

Thermal Transfer Printing technology works on a heating concept that transfers heat to the print head which then transfers the colour of the ribbon / graphics onto the label. This results in durable, high quality labels that can be used under a wide range of environments, including extreme environments. With the wide range of colour ribbons available, thermal transfer printing technology is suitable for many applications.



Finishes by Other Meterials and Processes



Etched decorative metal parts

A new standard for decoration of high end products. Possible applications include mobile phones, computers and other electronic equipment. Utilising the unique etching technology it is possible to generate a raster image in a stainless steel surface. The un-etched surface can be ground, soft polished, brushed, mirror blank or anything in between. The surface can be hard coated to protect from fingerprints and scratches. The parts can furthermore be formed in 3D shapes.

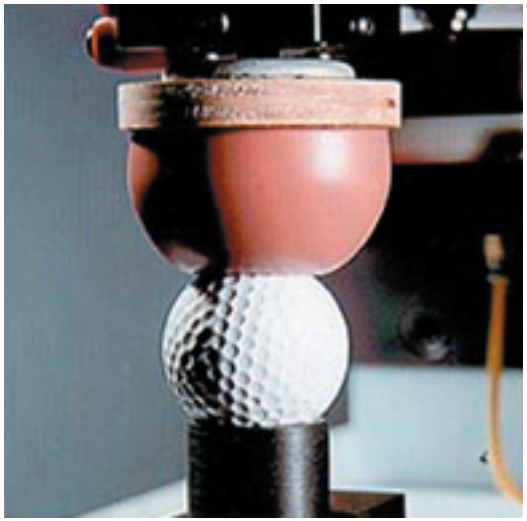
- Complex geometry´s and fine details
- Ability to process large areas
- No limitation for featuring depth
- No burrs or tensions from etching
- Tight tolerances
- Raw materials from brushed to mirror gloss
- Decorative coatings using sputtering technique
- Short lead times

Laser imaging

Laser Imaging allows marvellously accurate full colour images to be produced on 3D objects. This technique can be applied to any substrate, from plastic to ceramic. Clear topcoats enhance the colour and provide excellent wear resistance. The web based interface and production system provides the freedom to automate individualised production, to produce truly one of a kind works of art.

http://www.savcor.com/coatings/lens.php

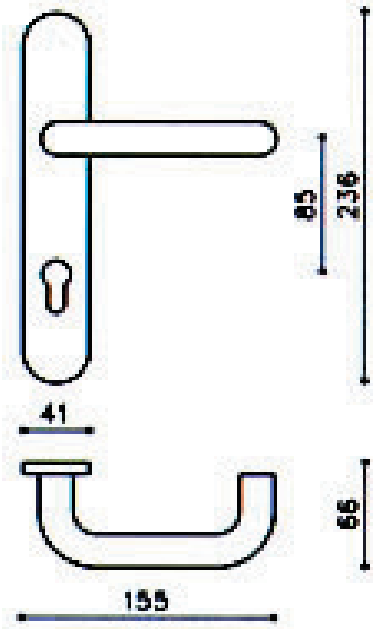
Finishes by Other Meterials and Processes

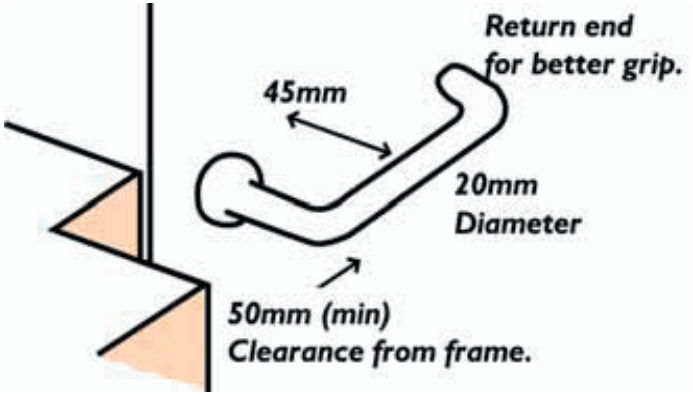


Pad Printing

It is to be remembered that pad printing can be used on objects of various material, such as plastic, glass, metal, ceramics, wood, etc., with the one recommendation to use its specific ink. So for its extreme adaptability, pad printings finds application in the most varied sectors of the market, especially high-technology industial products. The system of pad printing is utilized to mark, print, engrave, decorate, protect and glue. It allows even the finest lines to be reproduced with clearness, in one or more colors, printing wet on wet.

From the above data it is that with combitation some applications some decoration on the handle can be brought, which gives one more dimension for capturing the market. Heat transfer system, In-mould and over mould techniques which are the latest technologies where industries are trying to implement because of their cost effectiveness and easy process.





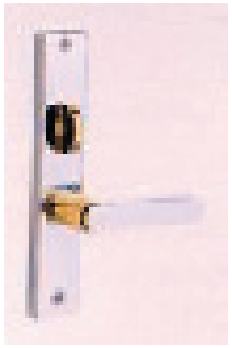
Dimensional Constraints

Godrej Lock division has given two dimensional constraints

1. The center to center distance between the handle and key hole should not change that is as per the given same it is 85mm.
2. The center to center distance between the screws holes which are used fit the handle onto the door also should not be changed which is equal to 210mm
3. Dimensions of the sample combi pack handle is as shown in the figure.

Human Factors Constraints

1. The force required to operate the handle and open the door should not be more than 20N.
2. The color of the handle should give the distinguishable with the door.
3. Lever handles are preferred than to knob sets.
4. The length of the handle should be minimum 145mm.
5. Griping dia of the handle should be minimum 20mm and maximum 35mm.
6. It is preferred if return end has a little bigger gripping dia.



Form

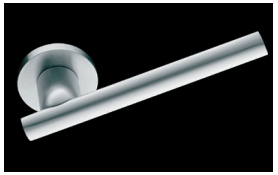
- Advancement in the form developement is seen in the Rose set than in the combi pack, this is because of market trend.
- Back plate form is not varied much may be to reduce the cost and brings commonality in respective range.
- Curved profiles are more dynamic and playful.
- Straight handle profiles look more elegant and modern.

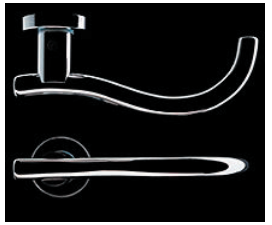
- Detailing of the fitting screws was not given attention in redesigning or relocating them.
- Except S curve and Straight profiles from front view, not much other exploration has been done.
- A feature line around the edges of the backplate is a simple detail which is giving life to the back plate. This is attained by embossing
- No shape edges or corners are projected out in the area of interaction of handle with the hand.
- For straight profile handles some detailing has been done with the help of embosing or engraving to bring some expression in the handle.

- Most of the handles are having bigger dia at one end of the handle.

Manufacturing

- Mainly brass is used by the Godrej handles and its competitors are using other materials. Interestingly brass has become a brand identity of Godrej.
- Many varieties of combi pack mortise lock handles are availale in brass.

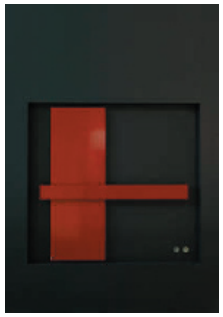




- Inclusion of other materials like plastics can give one more dimension to capture the market.
- New processes like forming and extrusion techniques are looking more effective than existing due to advance technology and reduced number of manufacturing processes for finishings.
- Handles are in solids shapes are manufactured by die casting or forging or extrusion.

Finishes

- Inclusion of new finishing processes on the handles can give new dimension to enhance the aesthetics



- Graphics are not used anywhere on the handles, instead to bring patterns engraving or embosing methods are followed.
- More number of finishes available with competitors and international companies.
- LASER etching can be used for engraving details.

- With different types of coating techniques many ranges can be produced by varying the graphics on it.
- Precoated or predecorated Sheet metals are readily available for fabrication.

- No Godrej product has combination(fusing) of two materials except in one rose set handle, instead Godrej has tried to give that effect my joining as a parts which are made up of different materials.

- Materials and expressions

Polished brass, black and gold	---- Elegance, Elightness
Matte nickel and gold	---- Richness
Brass	---- Religious, pure
chrome/nickel	---- Modern

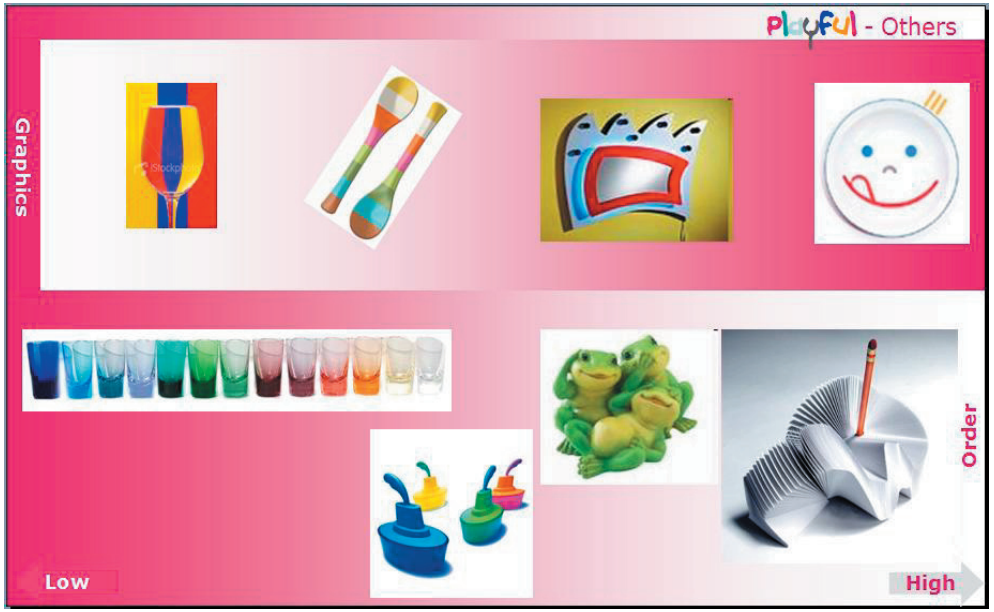
To design a range of mortise lock handles focusing on aesthetic appeal which will satisfy the following

1. **Form and Aesthetics**
    - The playful range appealing to the youth
    - An elegant range appealing to the middle age population
    - Postmodern look for the customers who wants to be different

2. **Manufacturing**
    - The manufacturing should look at reduction in cost by tooling.

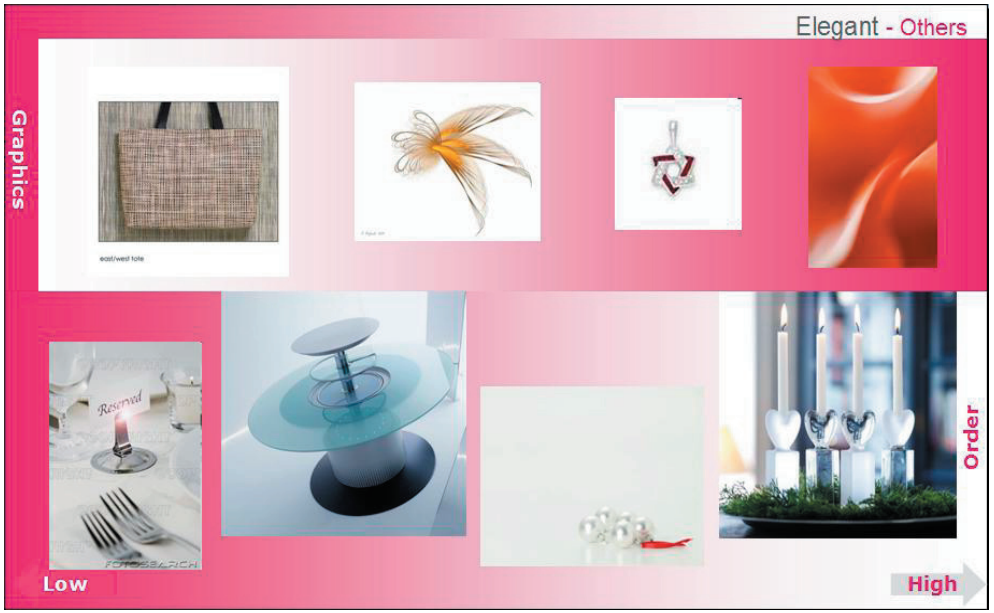
3. **Cost**
    - The manufacturing shoud be such that components used should have common dies.
    - The design and details of design is such that it should reflect Godrej's capability in precision die manufacturing.

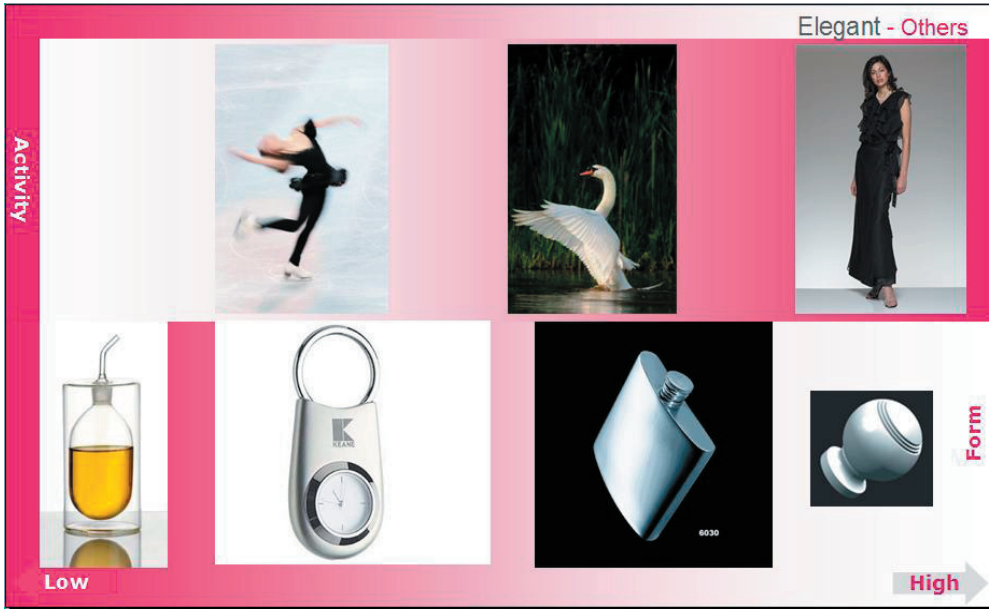
4. Each range should have a common back plate so that it is economical as well as defines a range



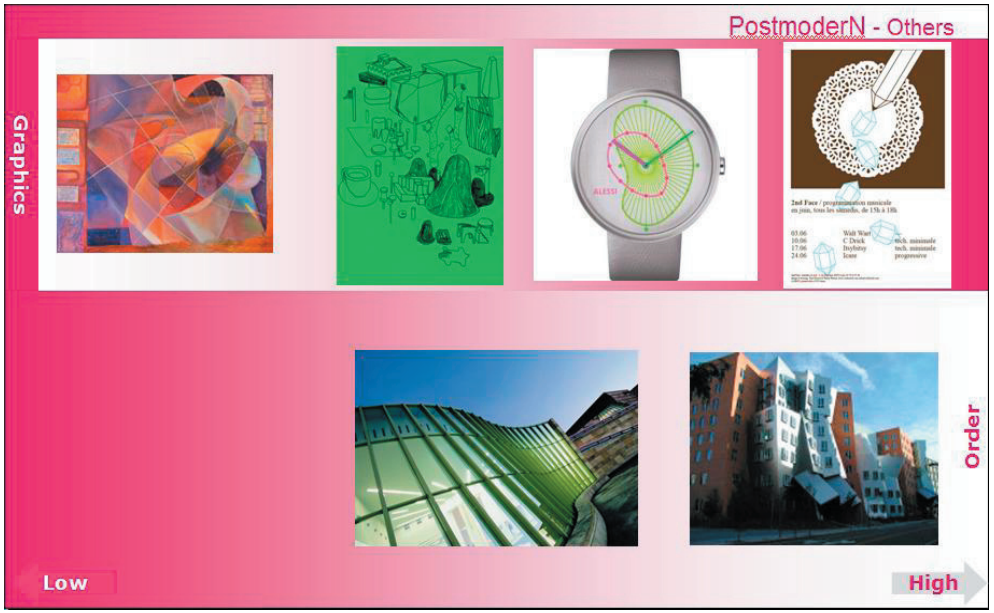
From the data collected three expressions i.e., playful, elegant and postmodern are derived and image boards are made for visual study based of handles and other products based on form, material, details, graphics and as an activity and they are ranked from high to low.

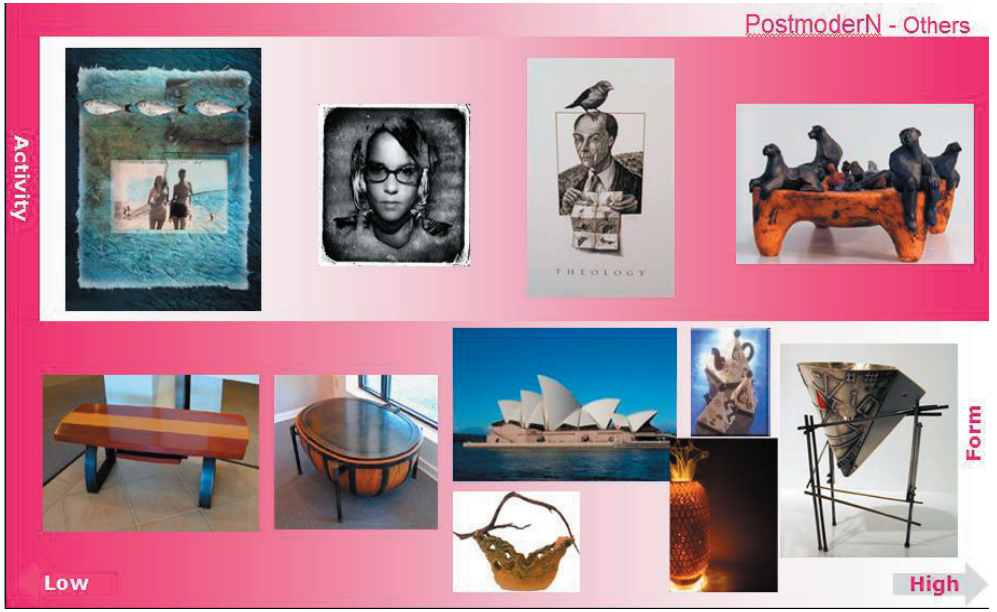
Line Quality	Curvatures
Edge Quality	Rounded, larger radius
Surface Quality	Matte, smooth/soft
Shape / Form	Asymmetry
Color	Primary, Contrast colors, Bi-colored
Orientation	Tilted, Dynamic
Proportions	2 : 1


Elegant - Others
Graphics
Order
Low
High


Elegant - Others
Activity
Form
Low
High

Line Quality	Uniform, Straight
Edge Quality	Very Small radius at corners
Surface Quality	Clean, Smooth
Shape / Form	Mostly regular
Color	Soft bright colors, metal lic, White with blue or black
Orientation	Straight


PostmoderN - Others
Graphics
Order
Low
High


PostmoderN - Others
Activity
Form
Low
High

Line Quality	Straight or curved but breaking
Edge Quality	Intersecting
Surface Quality	Glossy, Filled with Graffiti's
Shape / Form	Non orthogonal angles, disjunctive/open
Color	Green, Blue, Fluores cent, Natural Colors
Orientation	Random, Inclined

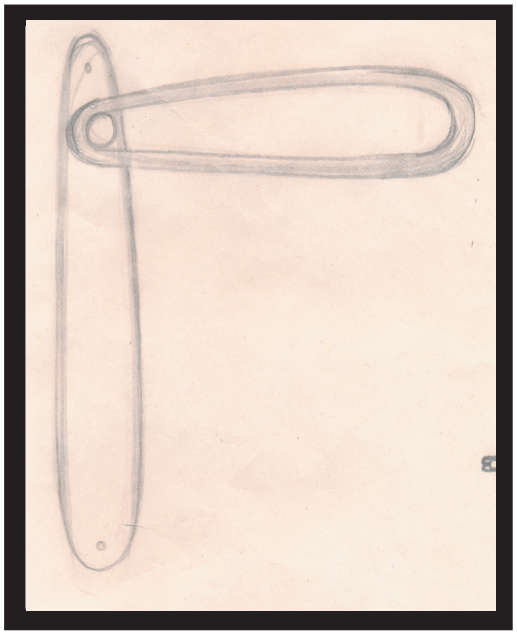
As the first step a number of ideas were created randomly to come upwith a wide range of variations. This forms the initial bank of ideas, from this using card sorting method the ideas were grouped into three categories based upon the manufacturing processes. Namely predominently rod based, predominently sheet based and predominently solid based.

Out of each of these categories the next step was to identify three representative ideas for playful expression, elegant expression and postmodern expression.

These ideas were further refined and converted into concepts.

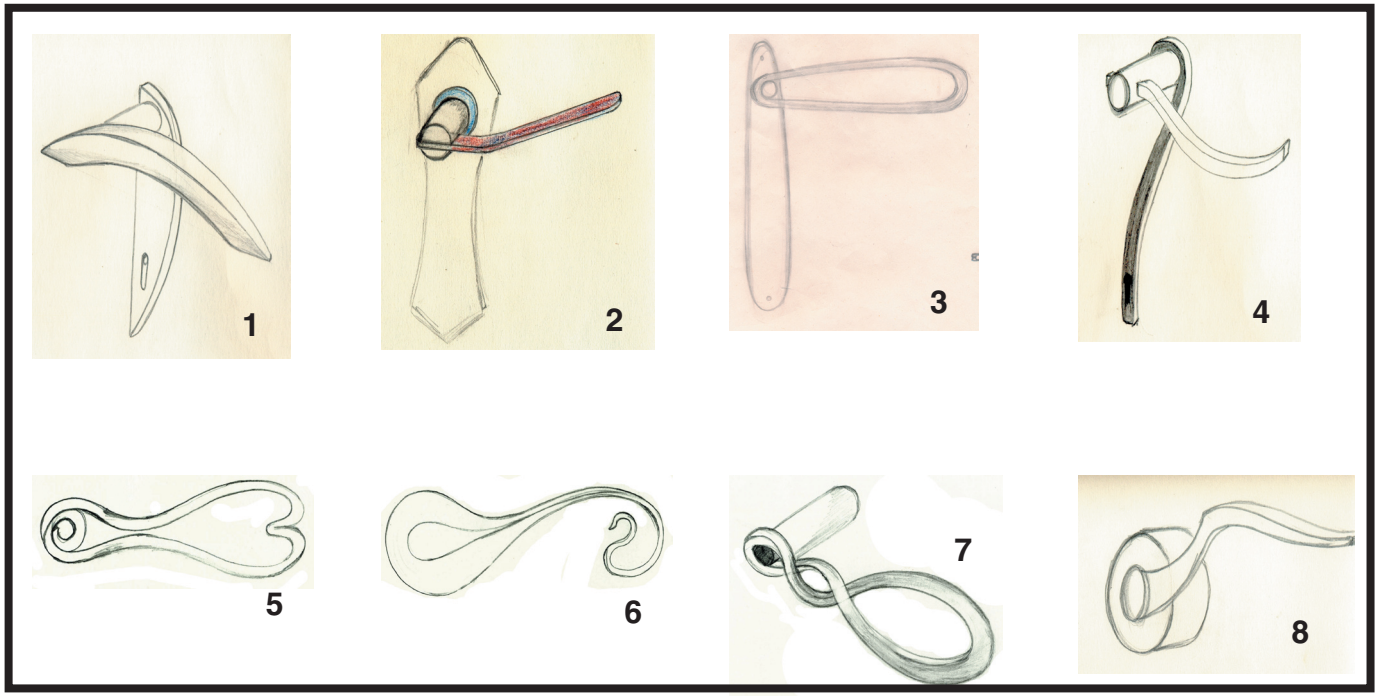
From the data collection expression expressed by the existing handles are listed out and an image is made for visual study of the features and elements.

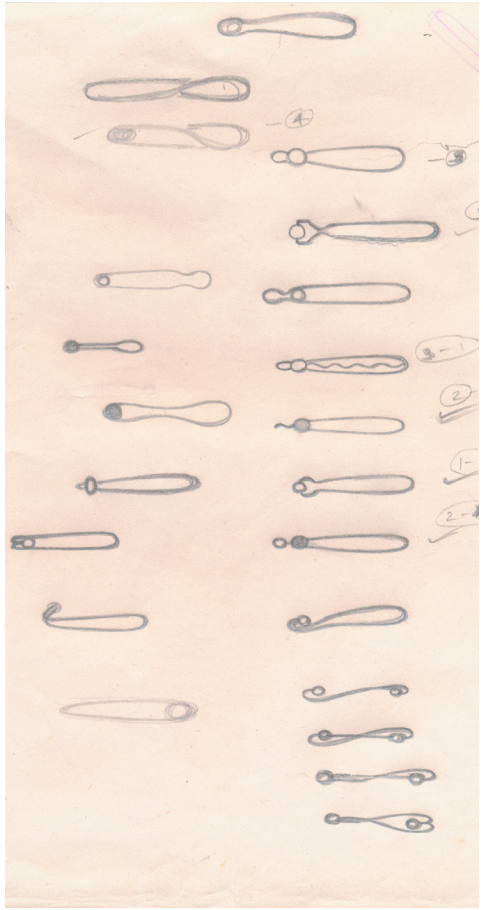
Cluster 1: Rod Shapes

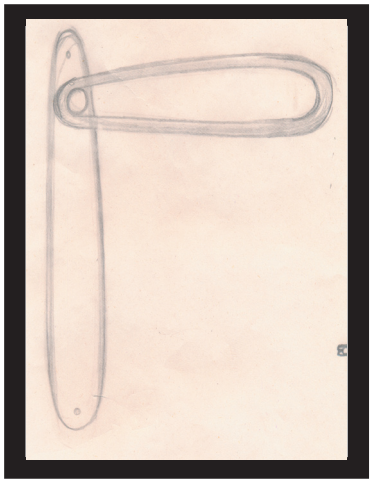


The following ideas were clustered as **play** as there is interesting interplay of elements is seen.

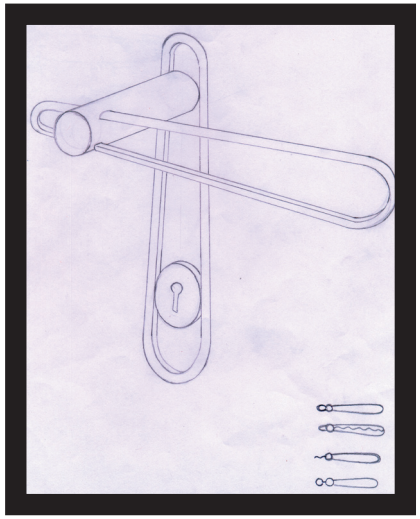
Idea number 3 was choosen as cluster representative. Features from every idea is taken and converted into concept.



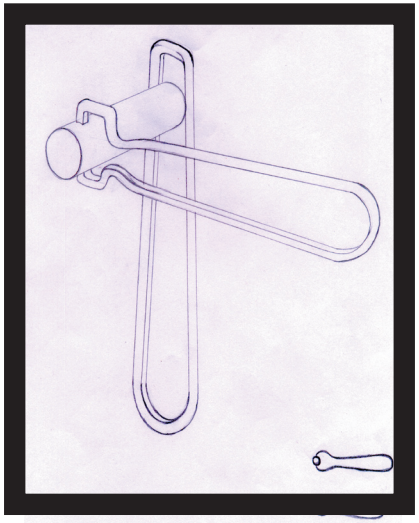




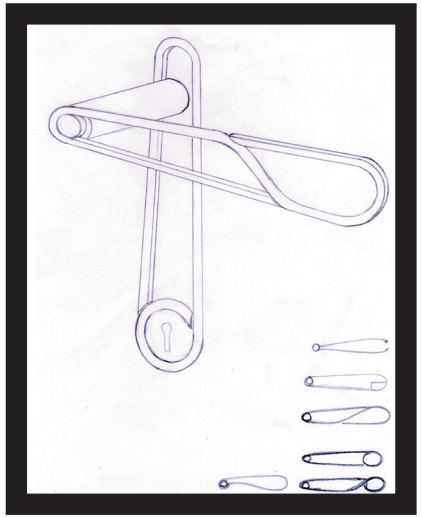
Play activity is brought up with foreground and background as the handle is hollow the back is a full sheet



Play is happening with flowing the into the one solid section and coming out.

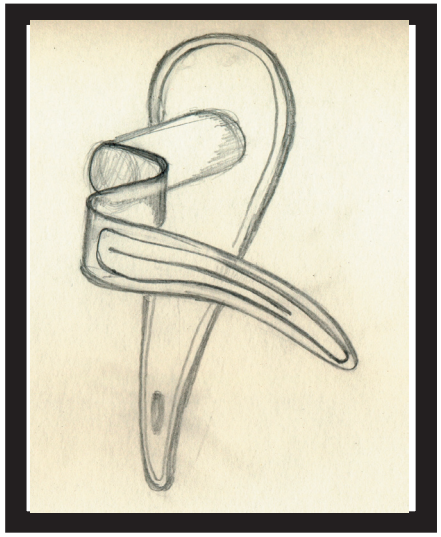


Here the play activity has come with lines of the rod of the handle.



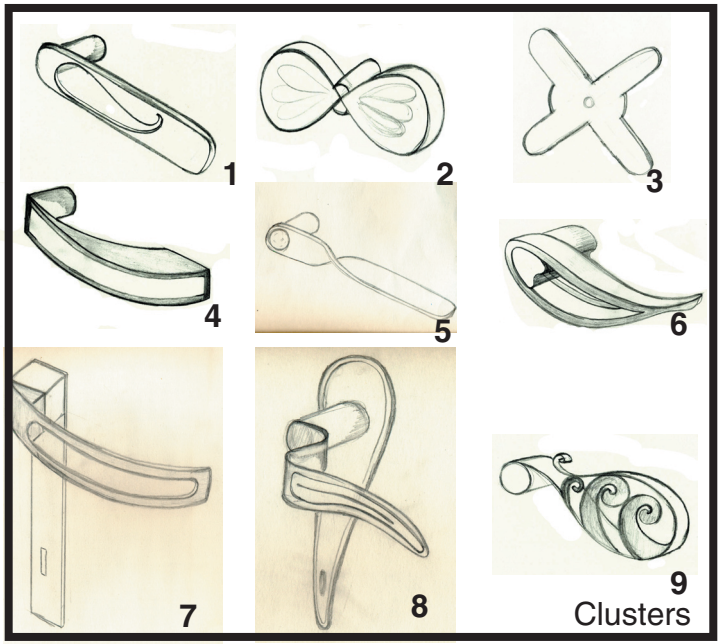
The insecting flow of lines are giving more interplay

Cluster 2: Sheet / Flat Shapes



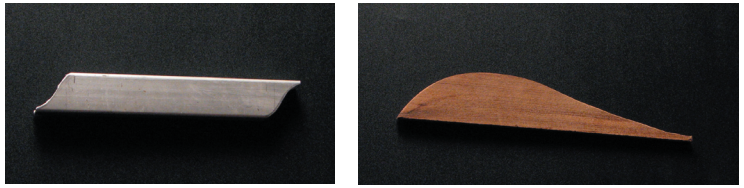
The following ideas were clustered as **play** as there is interesting interplay with the bents in the sheet is seen.

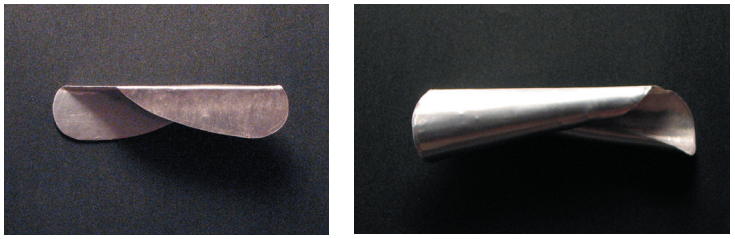
Idea number 8 was choosen as cluster representative. Features from every idea is taken and converted into concept.

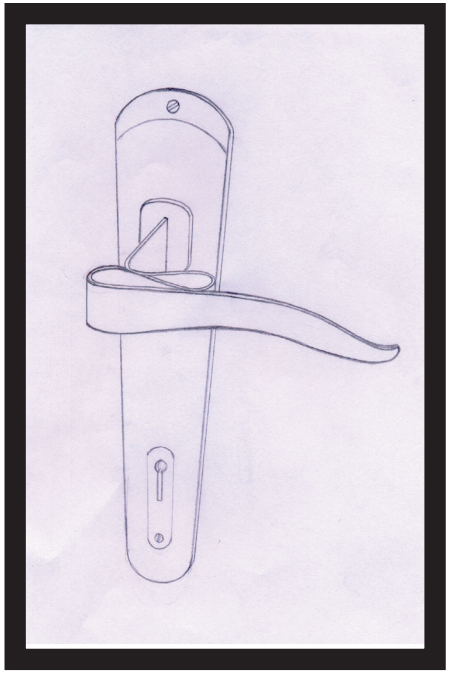


Clusters

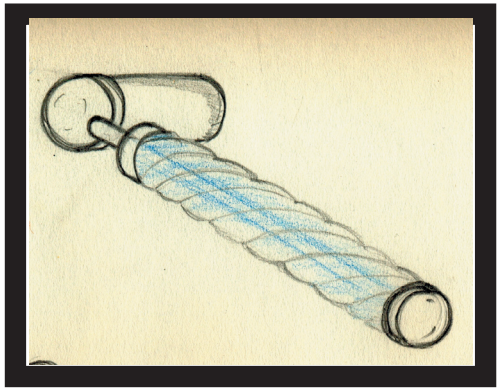
Mockups





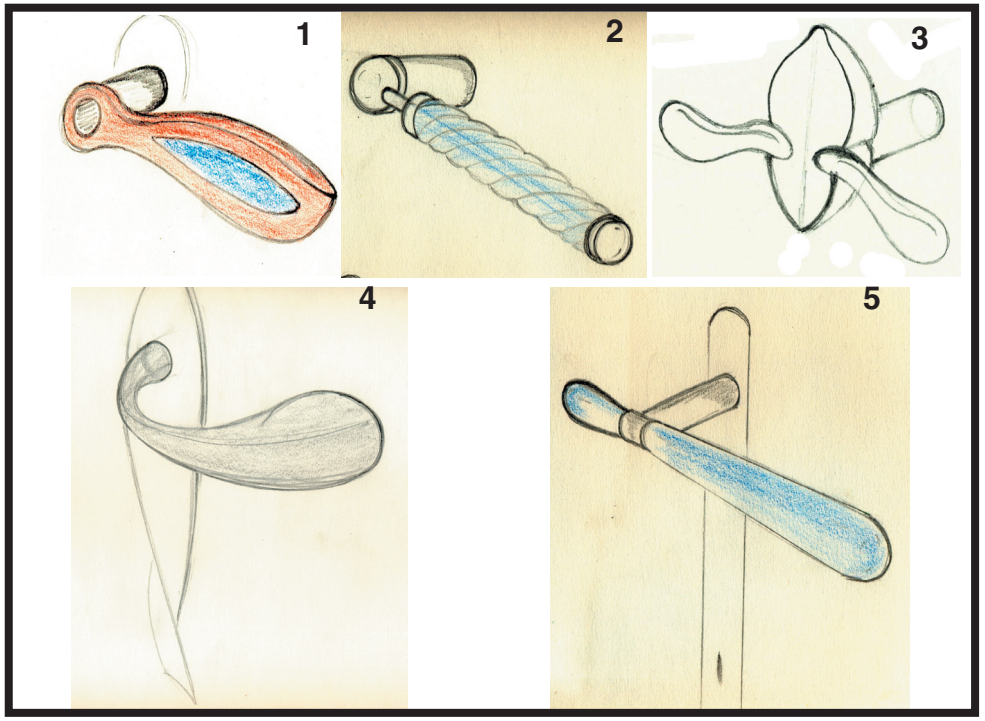


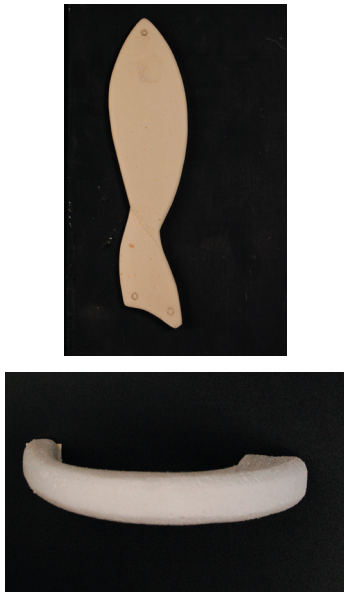
Cluster 3: Solid Shapes



The following ideas were clustered as **play** as there is an interesting twisting of line in the solid forms is seen.

Idea number 3 was choosen as cluster representative. Features from every idea is taken and converted into concept.

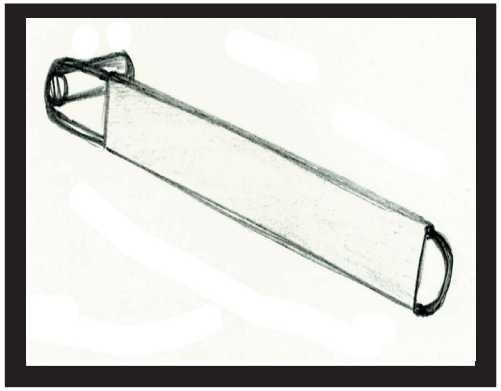




Mockups

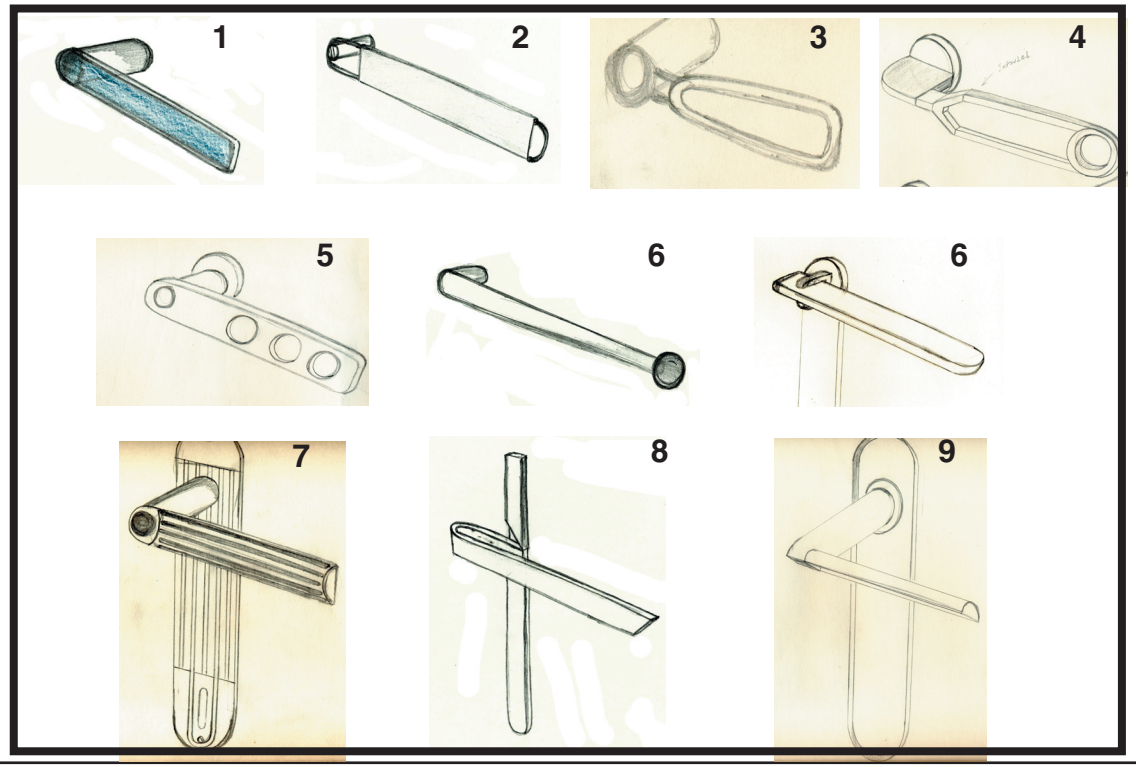
No Sketch Available

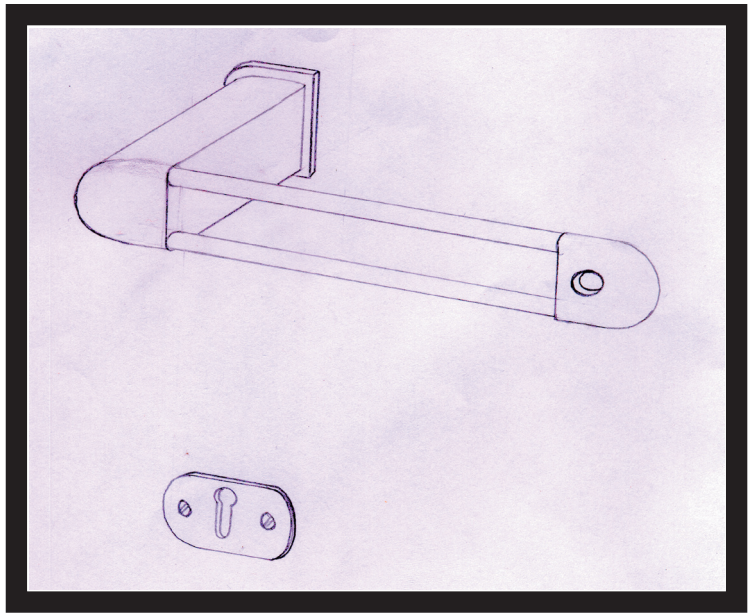
Cluster 4: Rod Shapes



The following ideas were clustered as **elegant** as there is an sleekness by the straight lines with small bends in the ends.

Idea number 2 was choosen as cluster representative. Features from every idea is taken and converted into concept.



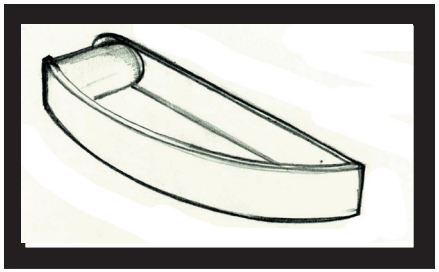


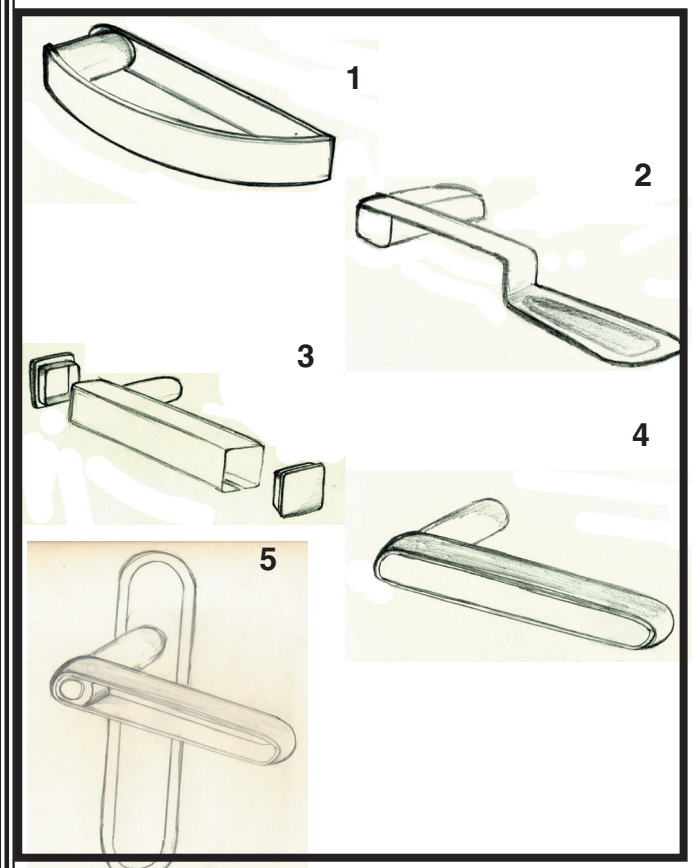
Concept Sketch

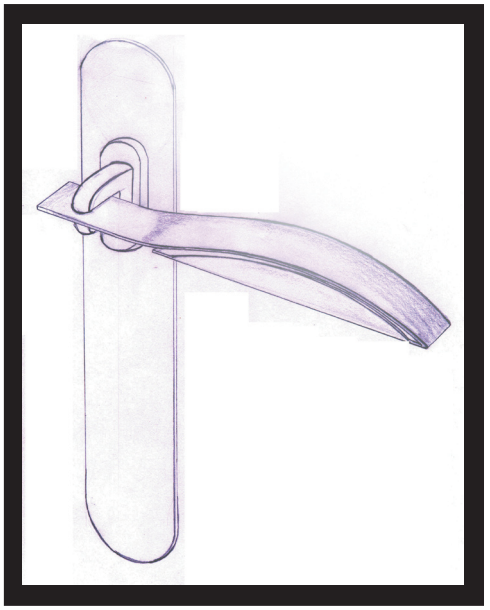
Cluster 5: Sheet / Flat Shapes

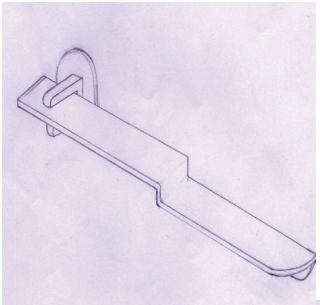
The following ideas were clustered as **elegant** as there is an sleekness in the whole form its with narrow bents and joint detail is seen.

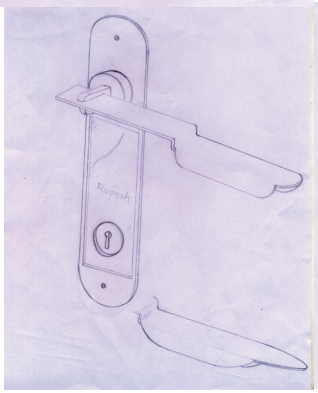
Idea number 1 was choosen as cluster representative. Features from every idea is taken and converted into concept.

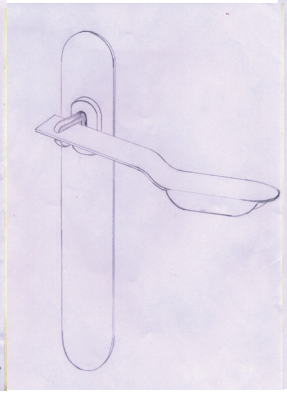


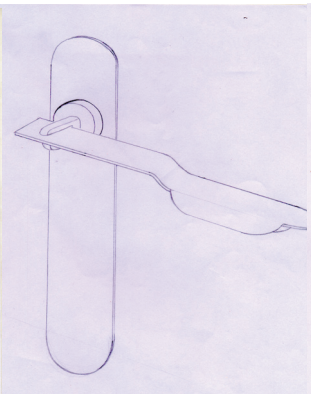


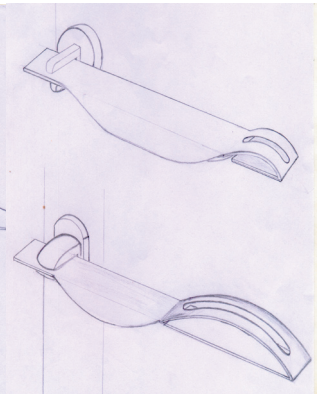




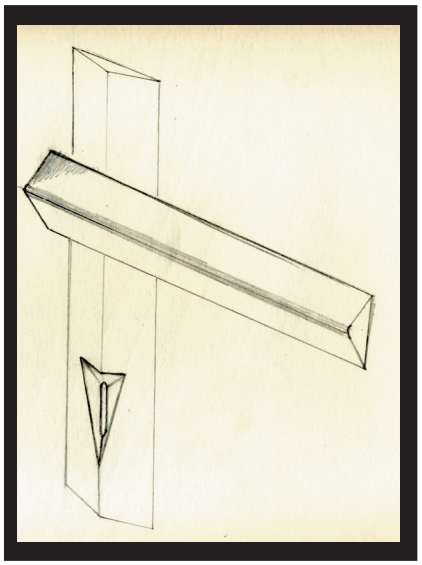






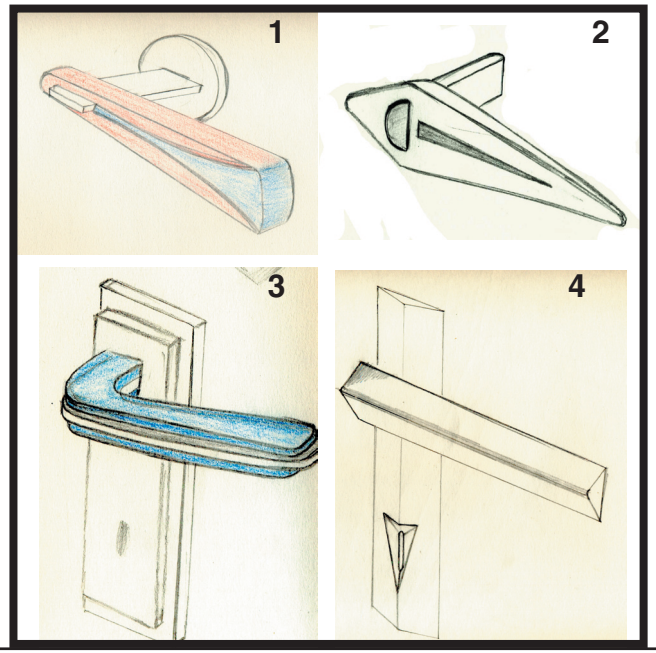


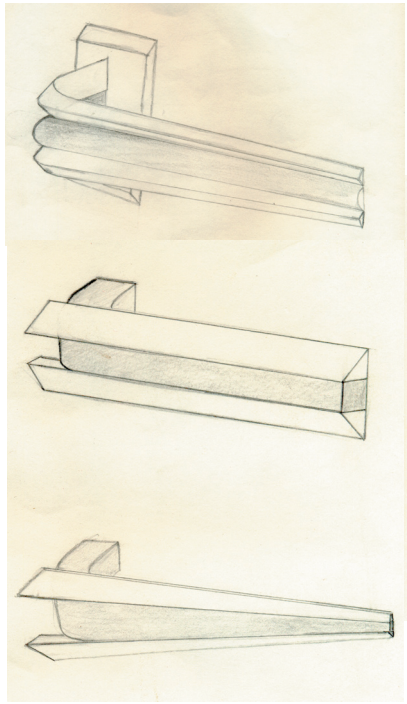
Cluster 6: Solid Shapes

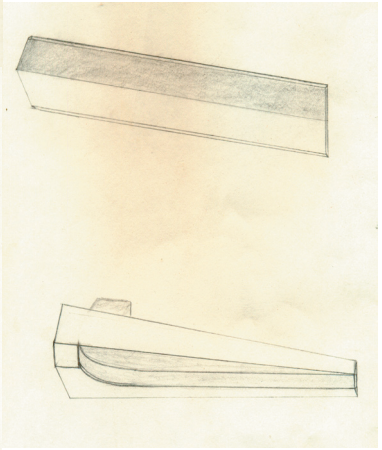


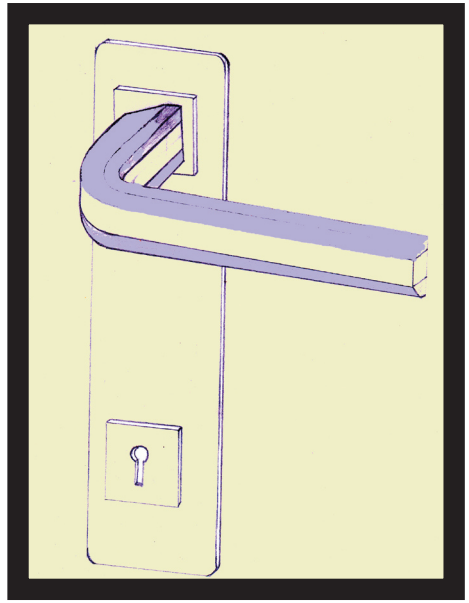
The following ideas were clustered as **elegant** as there is an proportions, simple geometrical shapes and continuity flow of line in the handle is seen.

Idea number 4 was choosen as cluster representative. Features from every idea is taken and converted into concept.

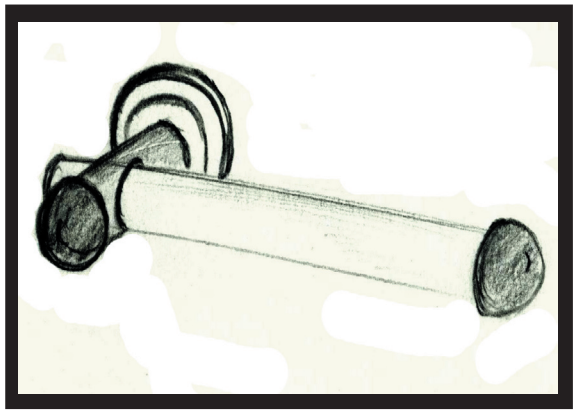








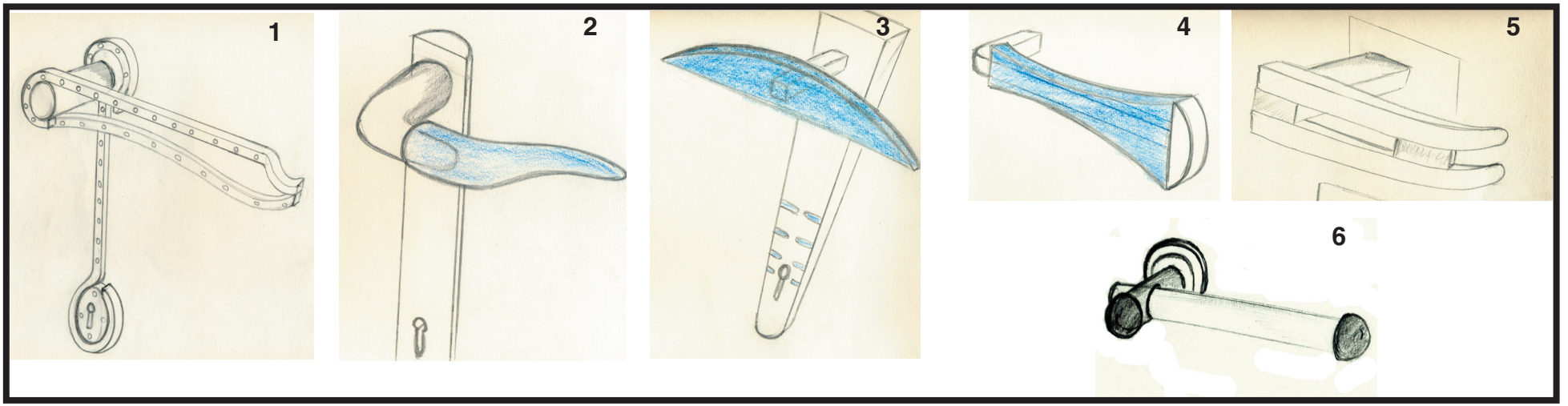
Cluster 7: Rod Shapes



The following ideas were clustered as **postmodern** as there is an irregularity in shapes and proportions, and discontinuity in the flow of lines is seen.

Idea number 6 was choosen as cluster representative. Features from every idea is taken and converted into concept.

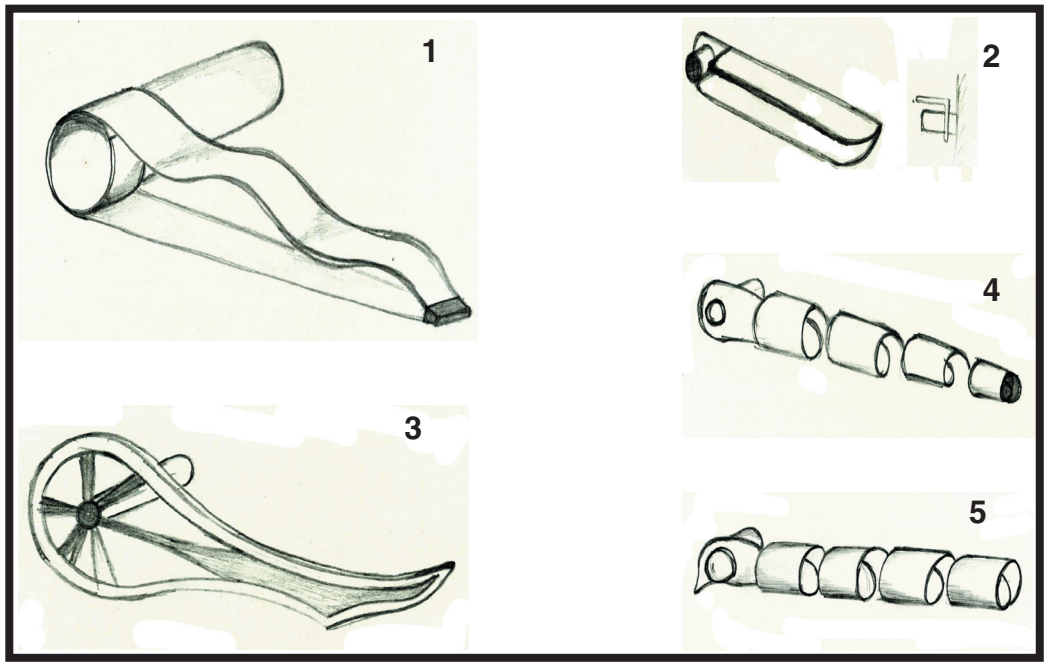
The concept is shown in the next stage



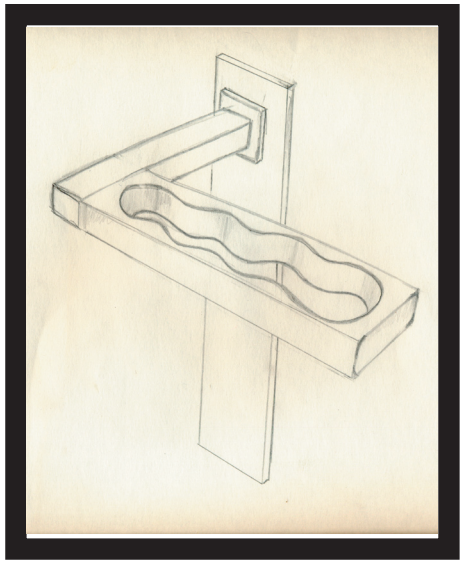
Cluster 8: Sheet/Flat Shapes

The following ideas were clustered as **postmodern** as there is an
Idea number 2 was choosen as cluster representative. Features from every idea is taken and converted into concept.

The concept is shown in the next stage

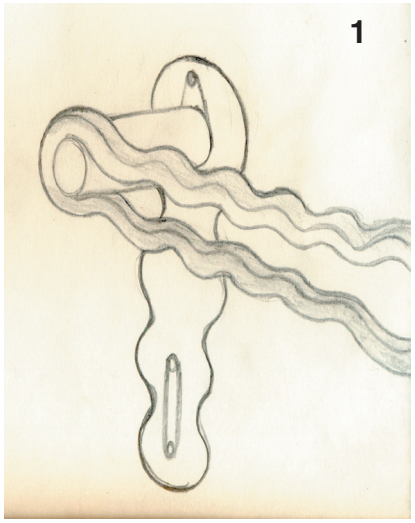


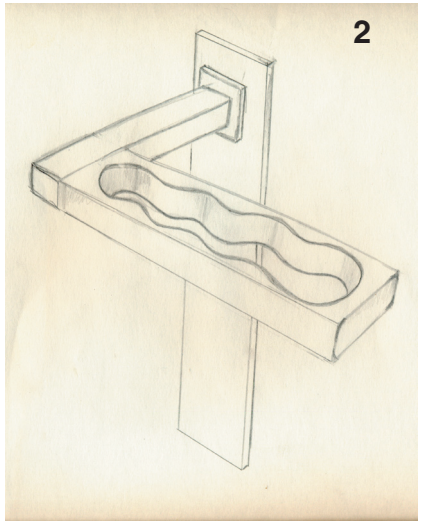
Cluster 9: Solid Shapes

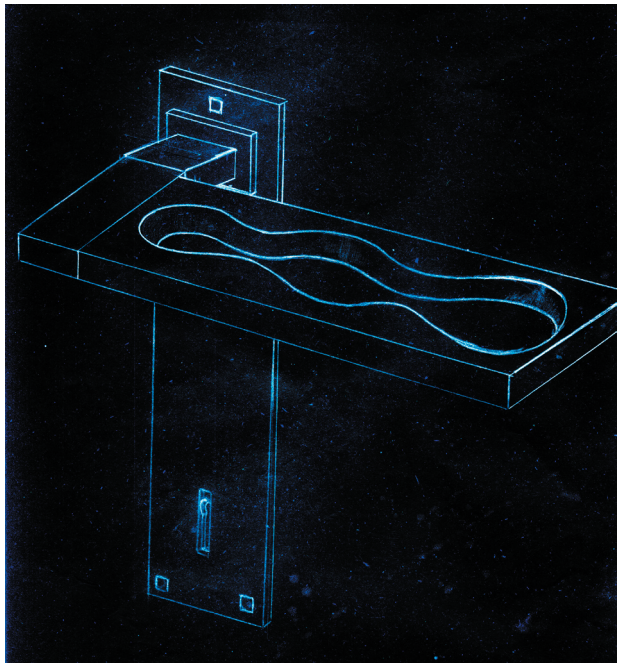


The following ideas were clustered as **postmodern** as there is a combination of regular and irregular flow of lines and negative and positive is seem. Bringing profile of the fingers on the handle that too in negative spaces places this concept in posmodern zone.

Idea number 2 was choosen as cluster representative. Features from every idea is taken and converted into concept.







The concepts are derived by the clusters and totally there are three range of handles which can be used for rose set as well as combipack models.

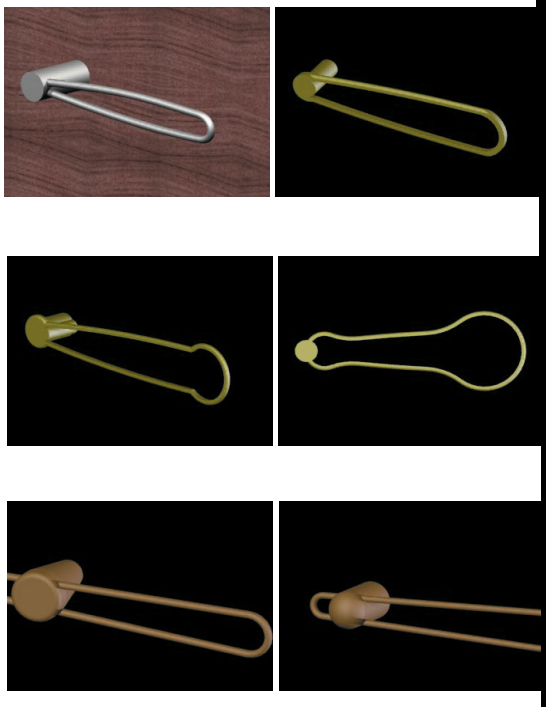
The back plate in the combi pack range are made common for ease of manufacturing and standardisation.

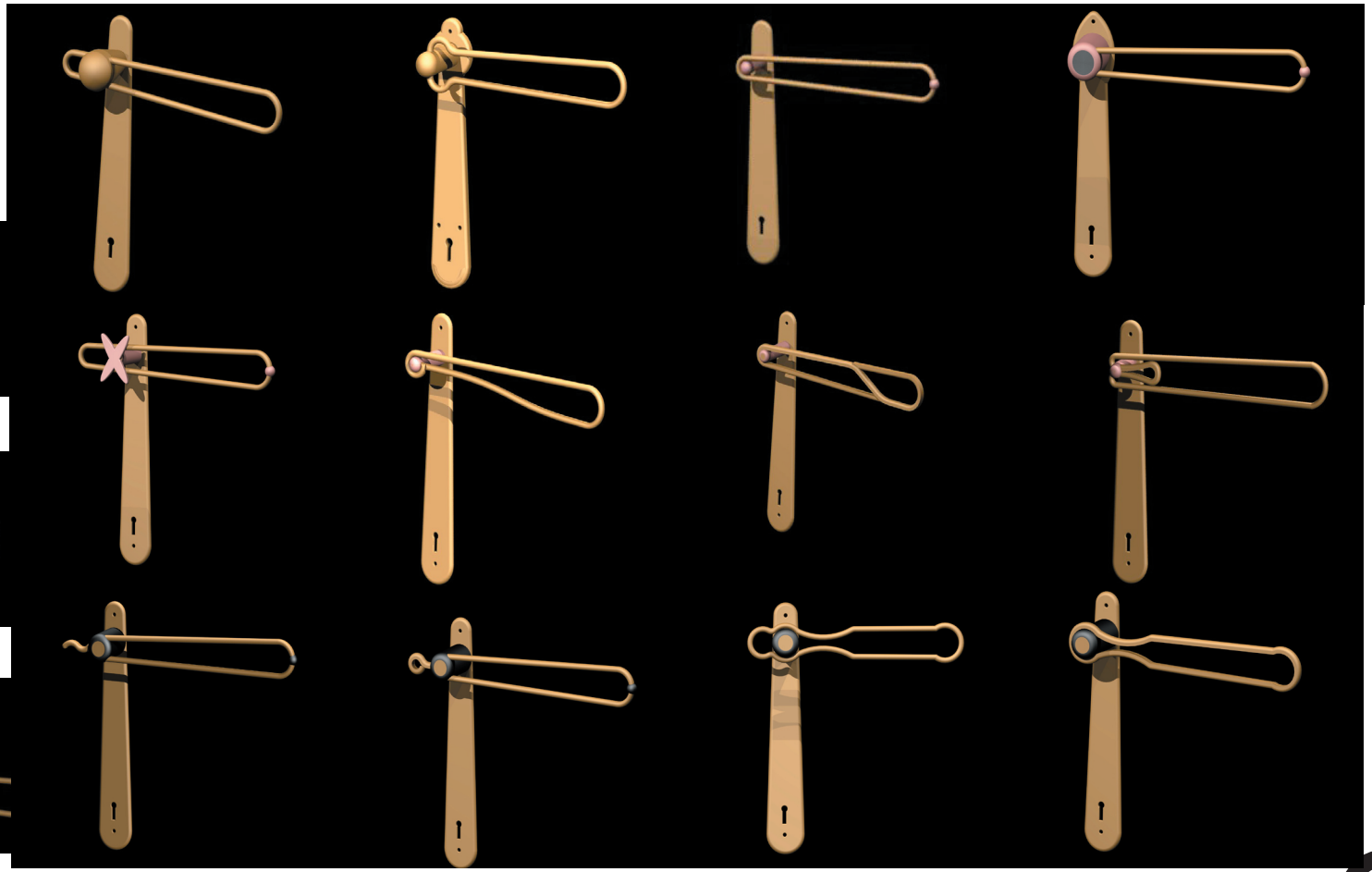
Concept 1: Rod Shapes

The interplay of the lines is varied by giving some radial curvature and different options were made keeping the play factor of the elements.

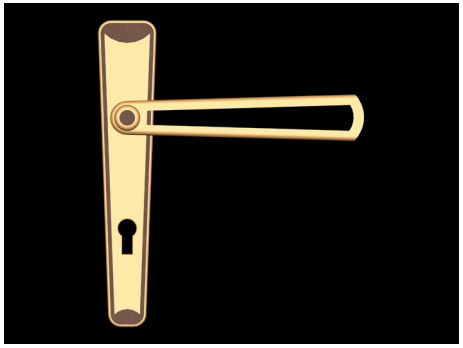
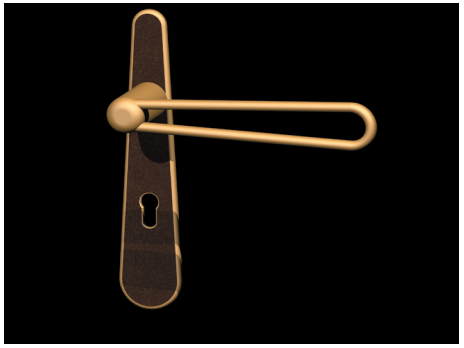
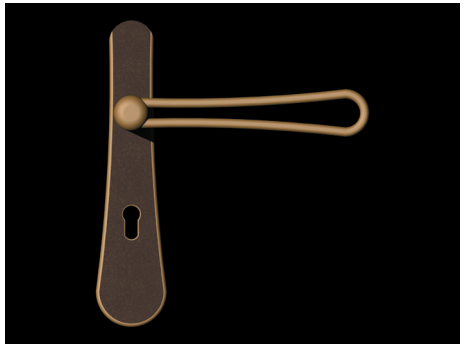
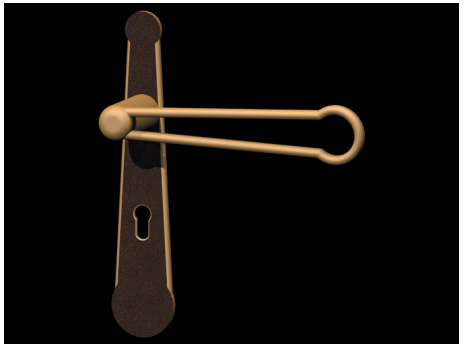
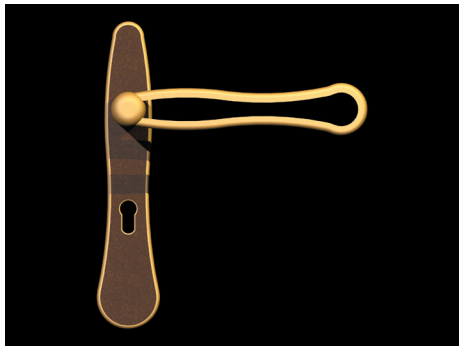
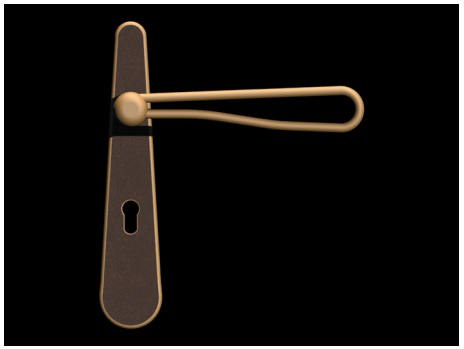
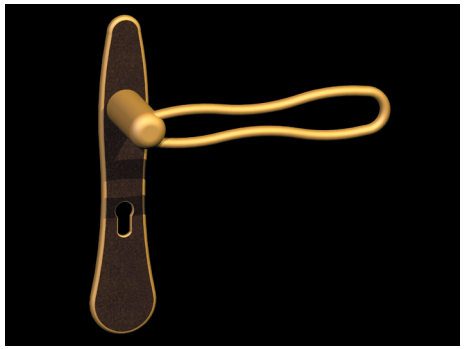
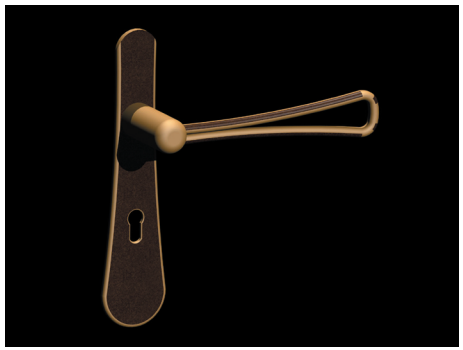
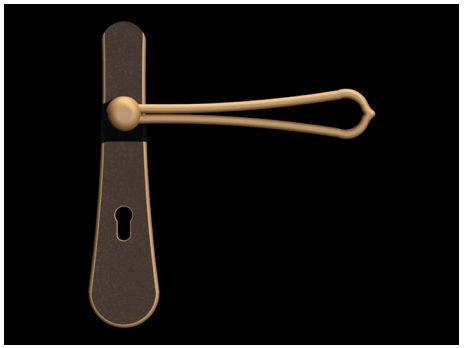
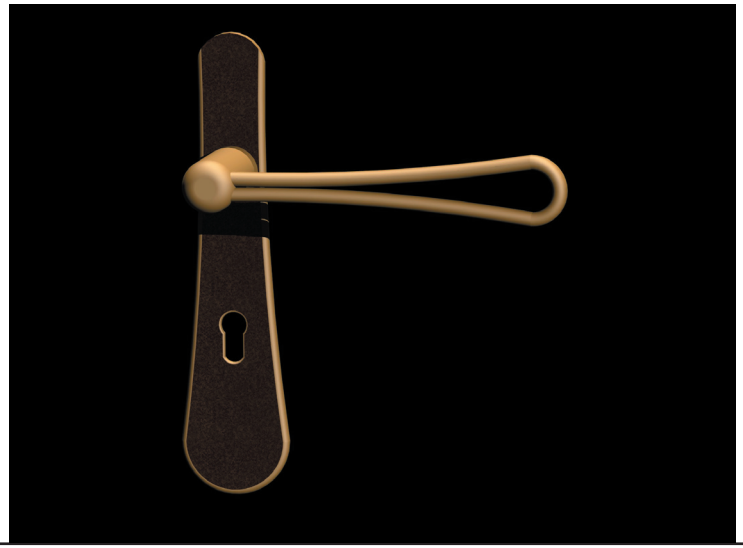
Mainly the line intersecting with the knob or rolling around the knob or an element which comes out as single line when two lines goes into the knob. These kind of exploration is shown in the below images.

Mockup Model





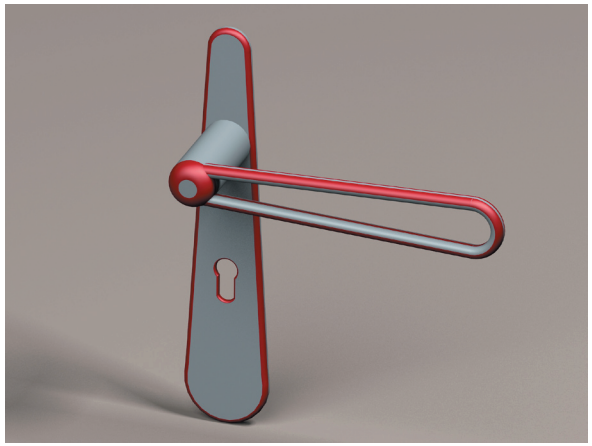
Concept 1: Rod Shapes

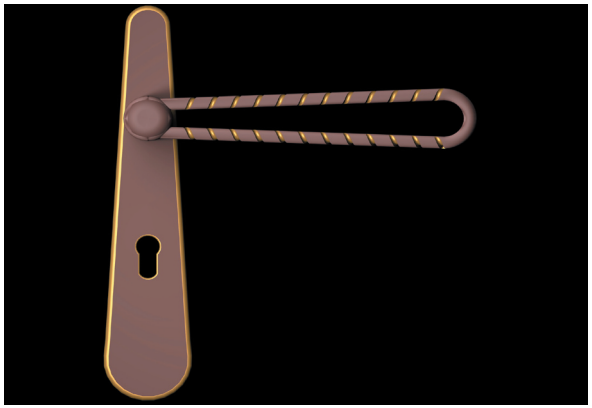











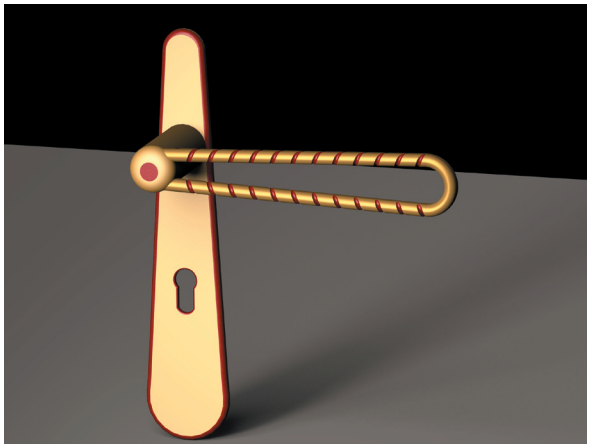
Selected Concepts and Graphics

Concept 1: Rod Shapes

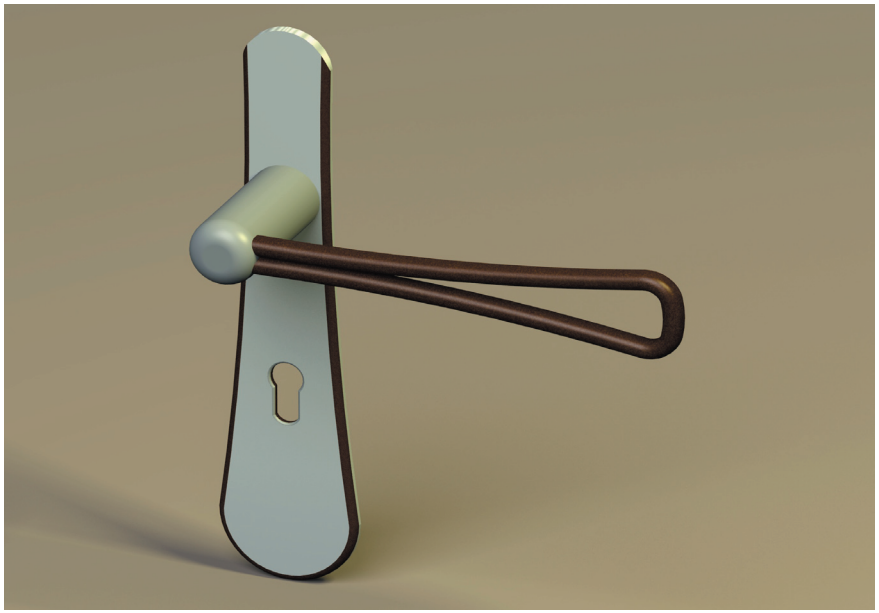
Graphics in 3D CAD Model



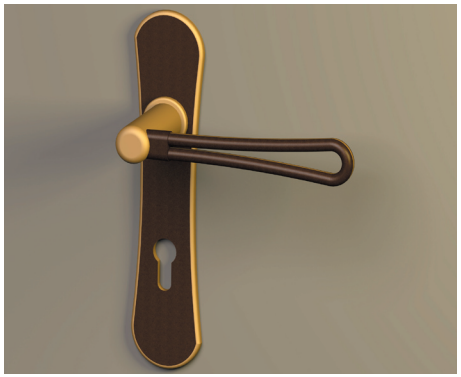




Final Concept Refinement



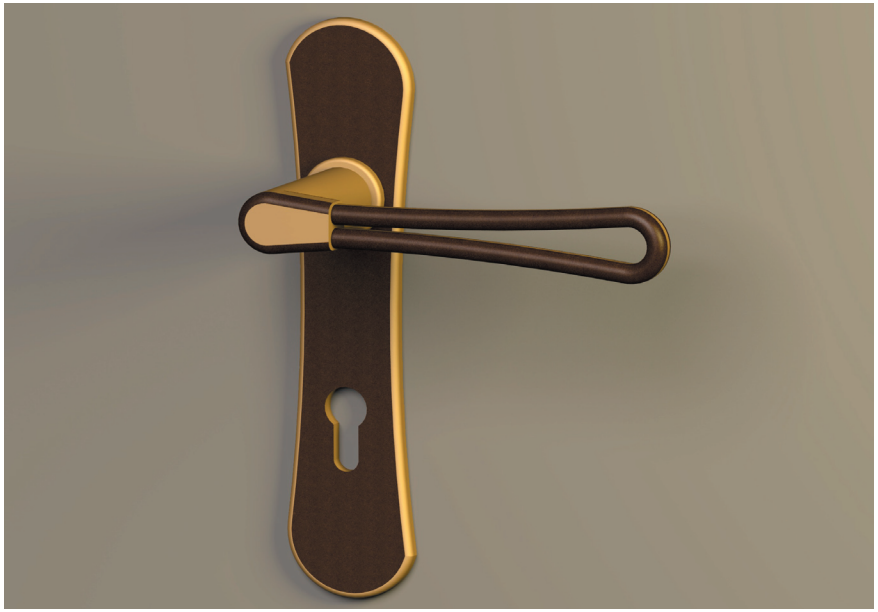
Rod Shapes



Griping of the handle is made more comfortable by reducing the gap between the rods. Visually it was disturbing in the previous designs when the gap was.

The joint detail of the knob and rods is shown in two ways in which in this below image the knob will be casted one, where as in the second detail the it has a plastic insert at the joint to give smooth continuity in the flow.

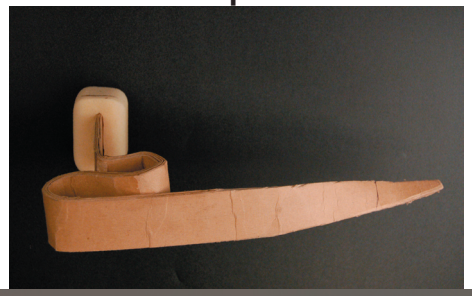
The handle rods is welded from the inside of the pipe.



Final Concept with Graphics in 3D CAD Model

Sheet/Flat Shapes

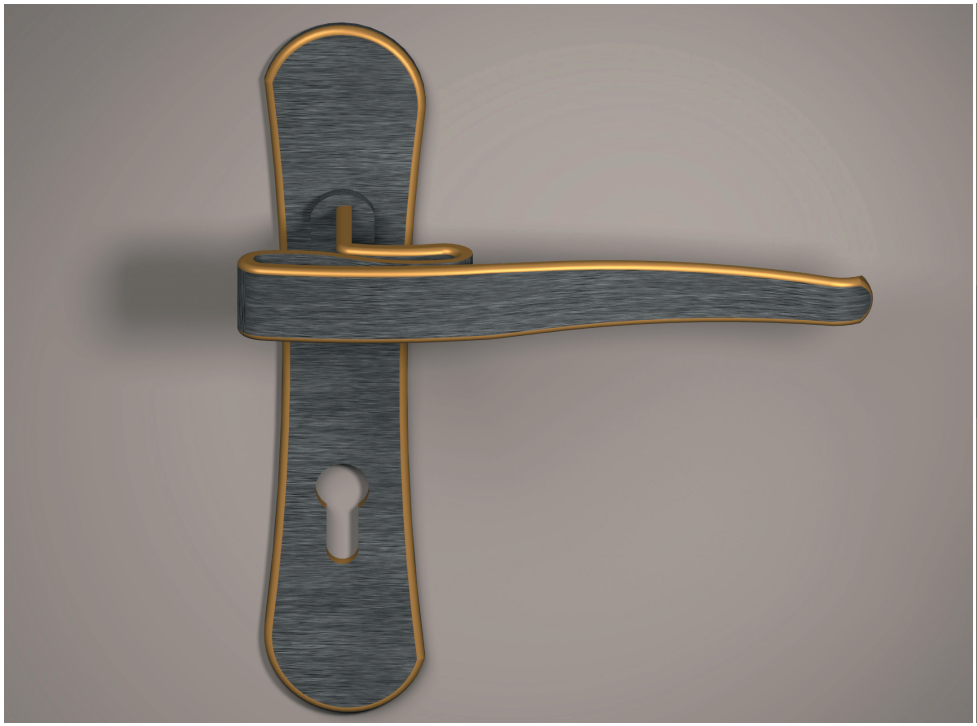
Mockup Model

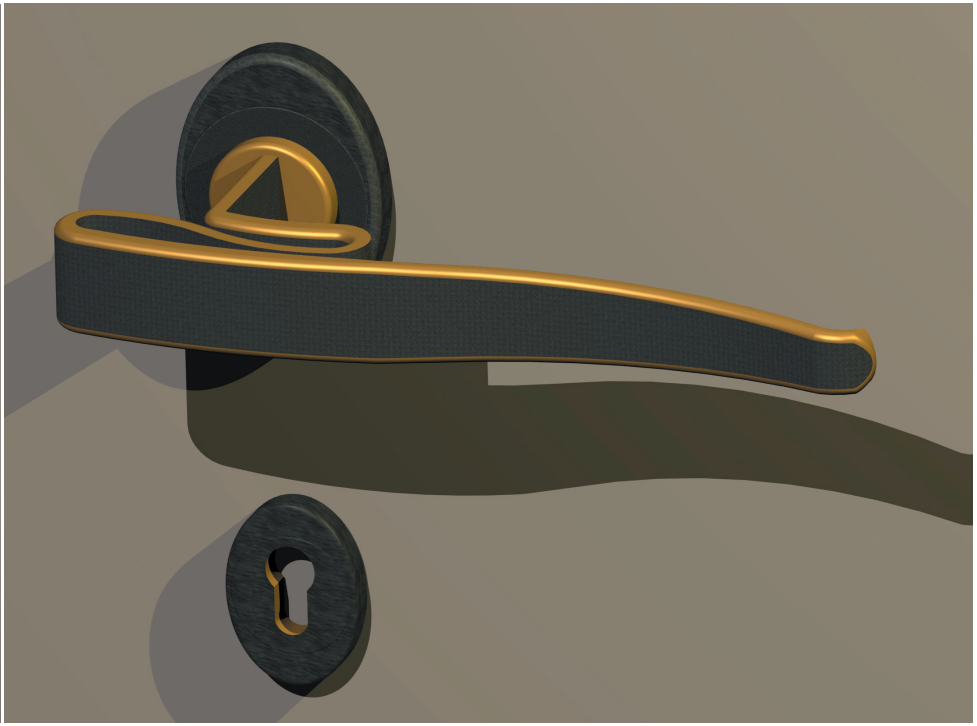


Keeping continuity in the flow of lines of the sheet, play has come with interesting curvatures and wavy look at the end. Breaking in the flow of lines at the joint of handle and knob is eliminated by continuing the sheet of the handle till the end, which takes over the duties of knob.

Sheet/Flat Shapes

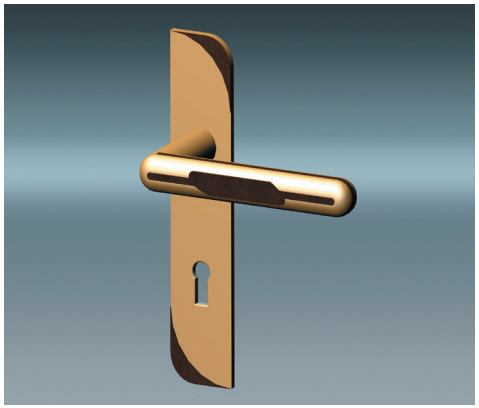
Different textures are applied and can be changed according the to the door and and need of the customer. Below images showns the form of the handle in combii pack as well as roseset mortise locks.s

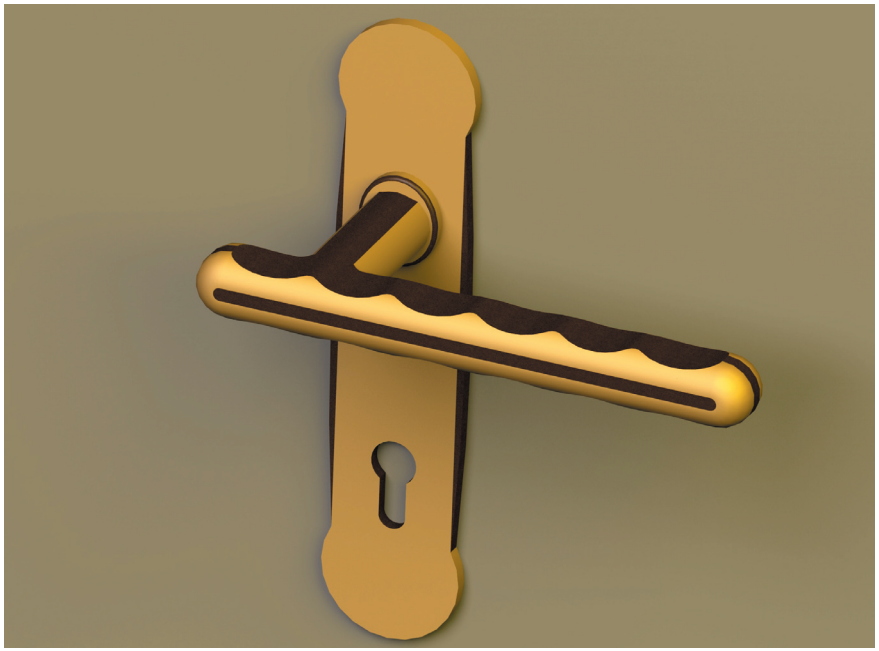


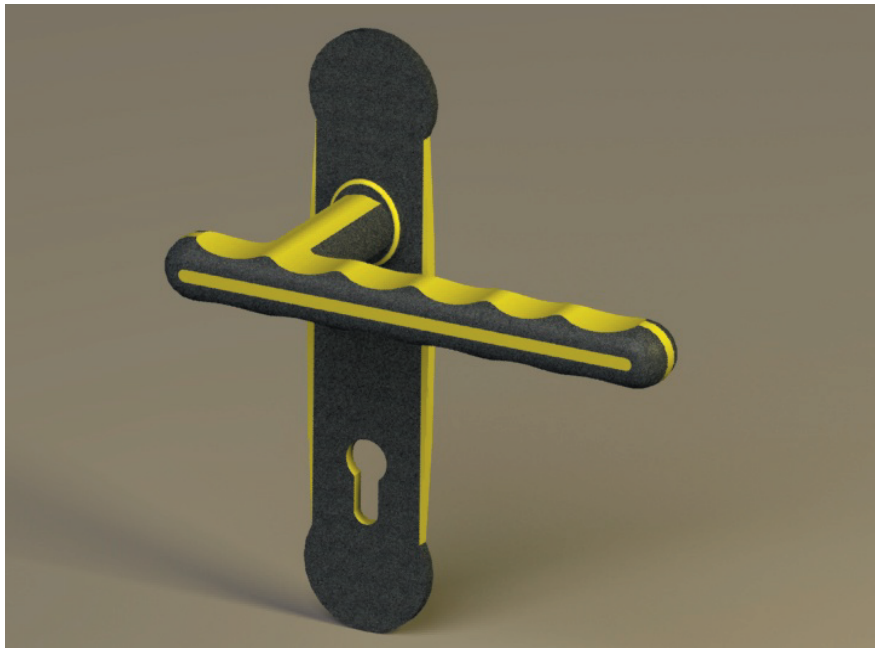


Solid Shapes

I designed this door handle so that it equally belongs to the door and the human hand. Minimal repetitive elements and patterns forming on the handle gives the feel of the waves flowing from one direction to another. The handle recalls the profile of the hand in a gesture of grasping.

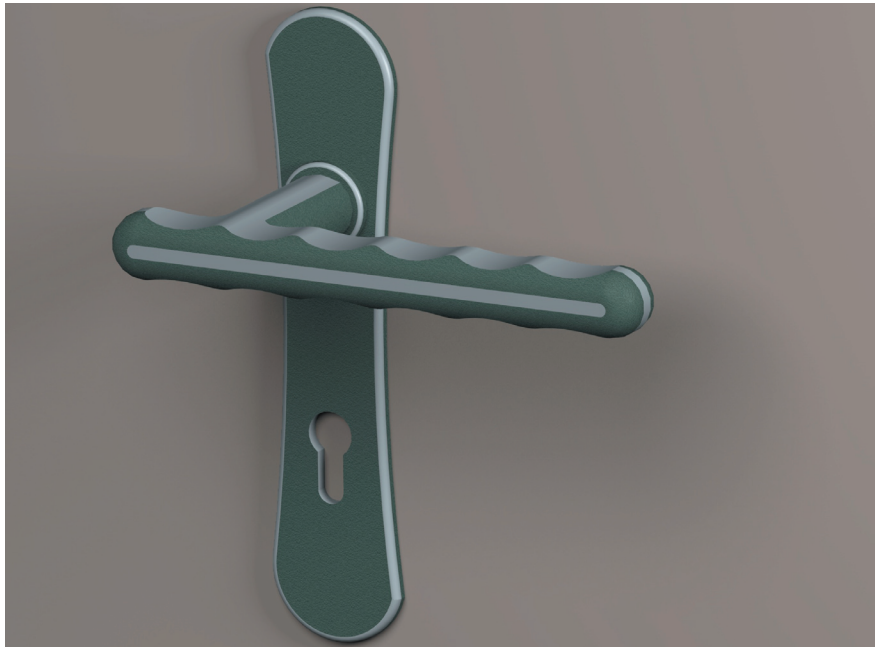


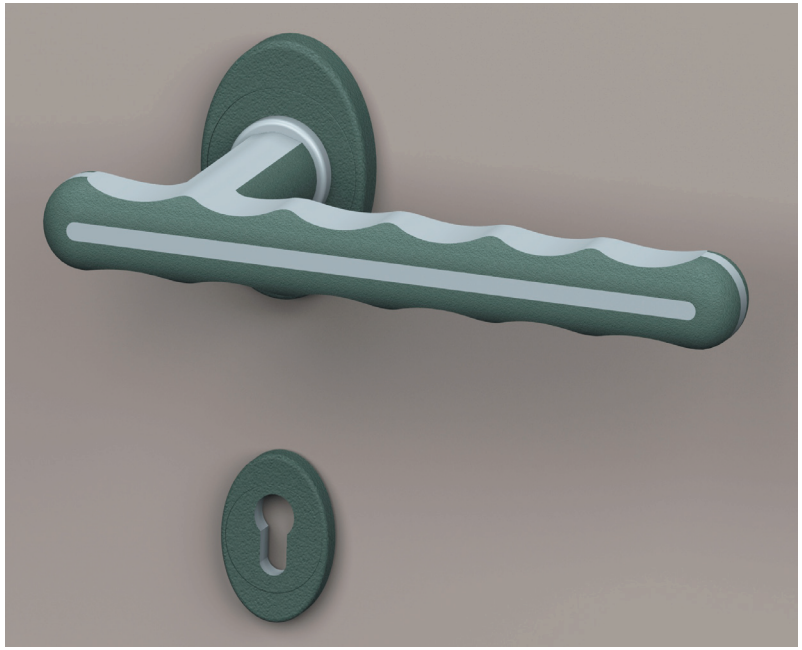




Solid Shapes

Use of In-mould or Over mould techniques matte soft texutures can be brought on the handle. The handle can also be manufactured either by die casting or by injection moulding. If injection moulding is used then plastics like PC-ABS, Nylon, etc. can be used for good strenght and for decorative surfaces.

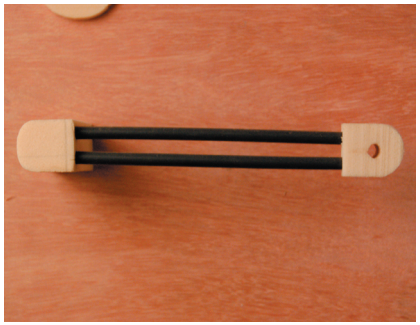


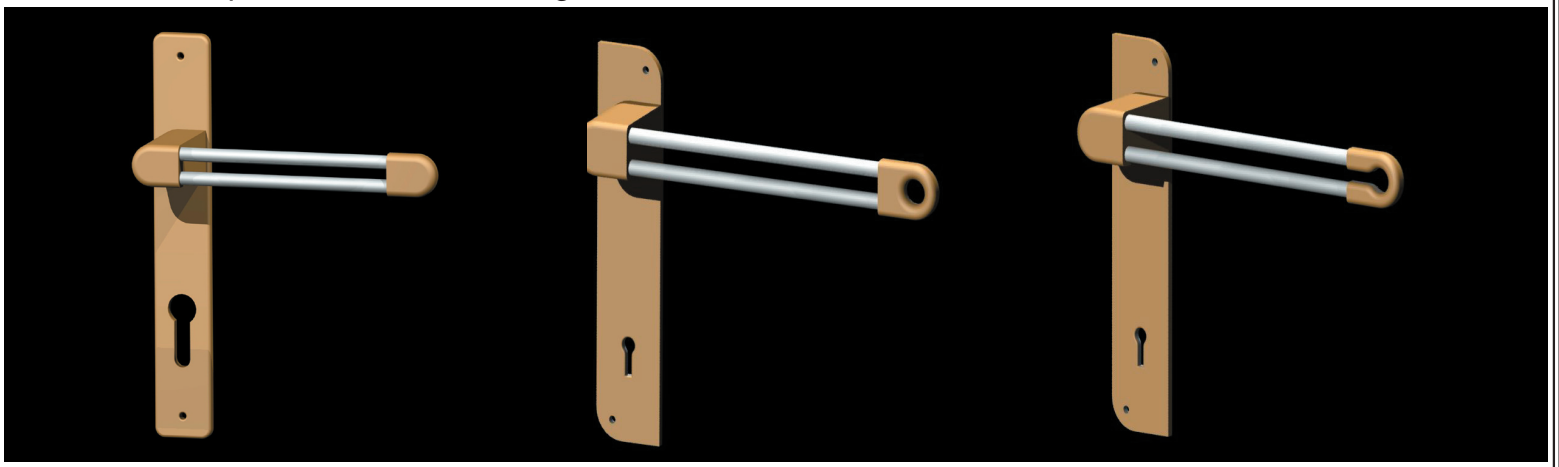


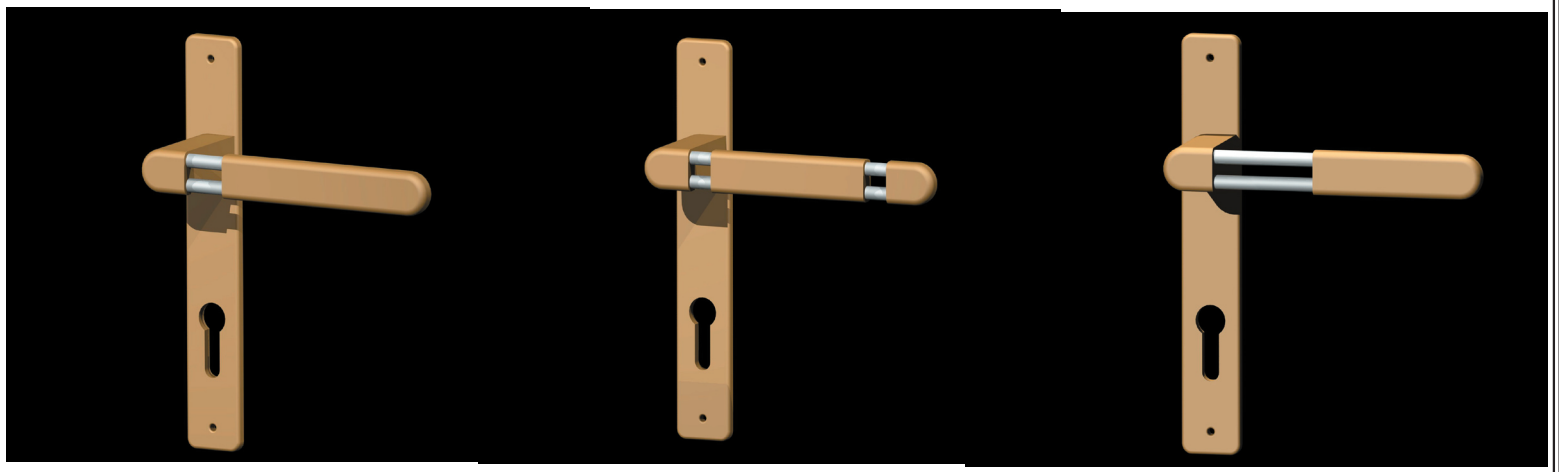
Concept 4: Rod Shapes

Variations in the end details and also the negative and positive in the handle are made. As the negative space is increased the sleekness is increases and which gives the feel of delicateness. So balancing these two parameters that is negative and positives spaces is optimised in the last images.

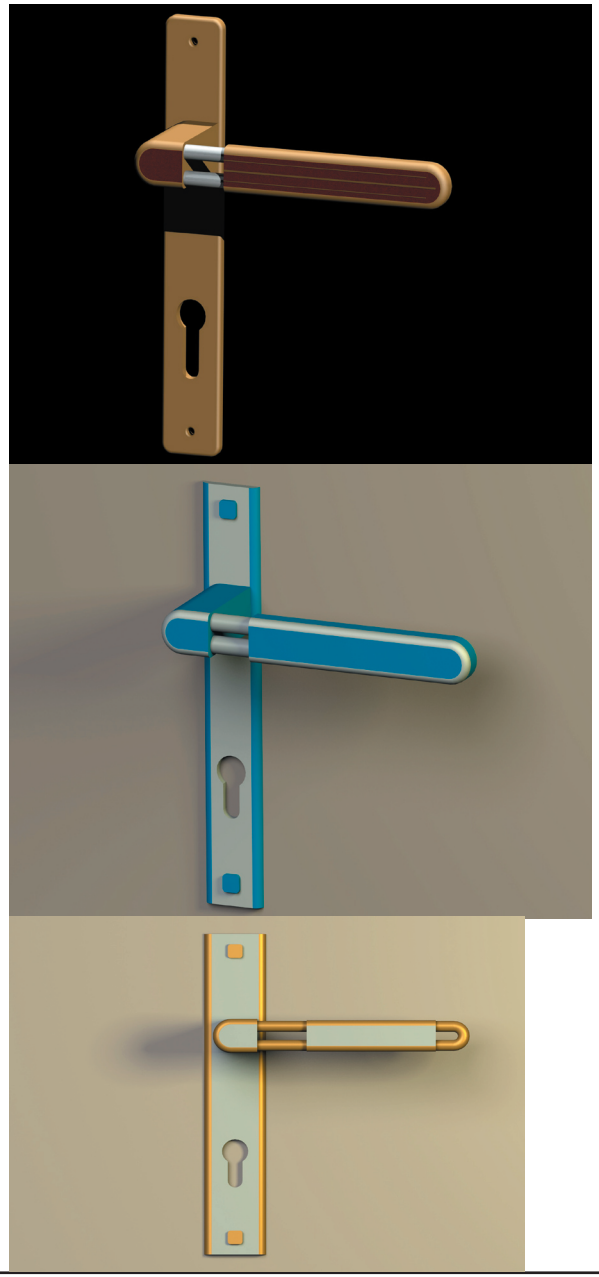
Mockup Model

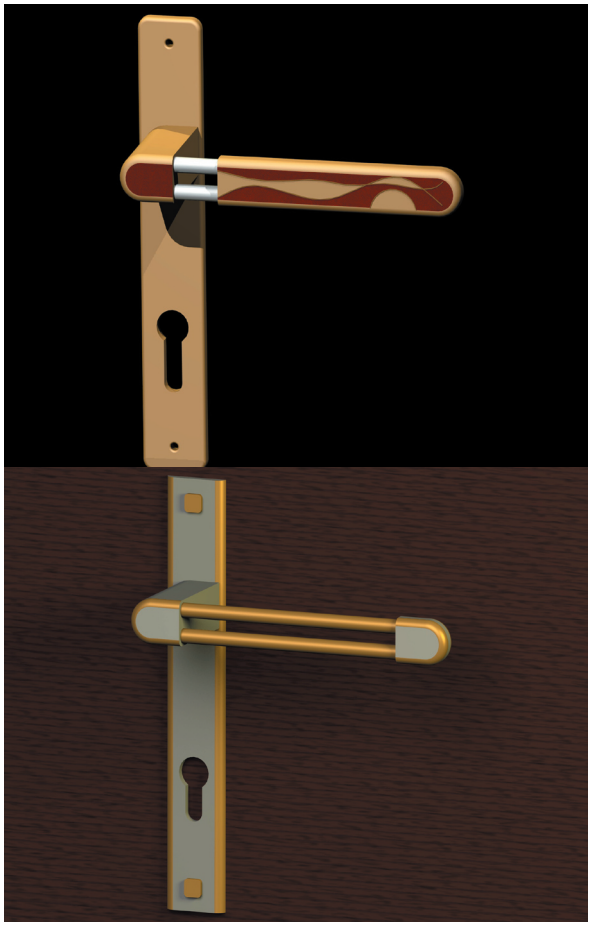


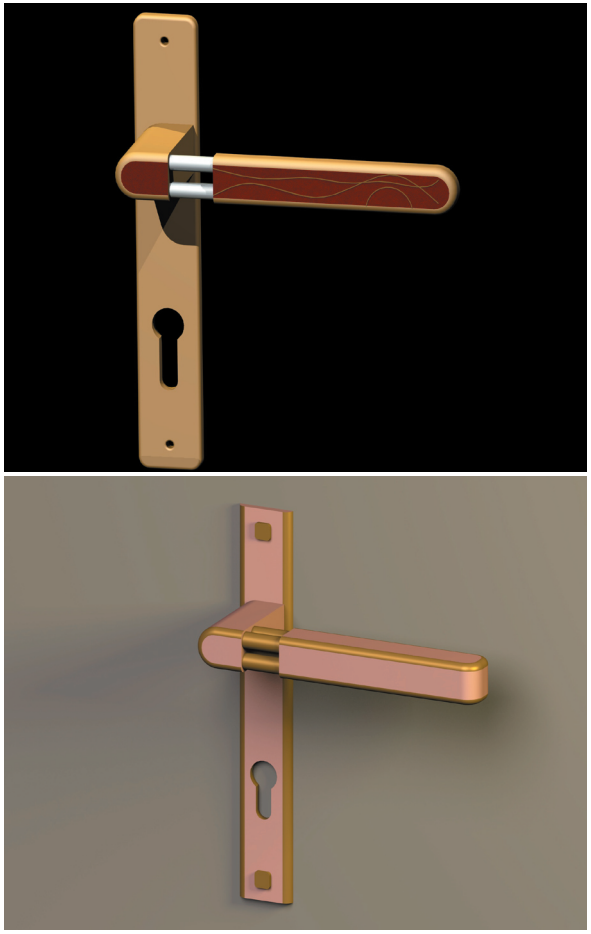




Concept 4: Rod Shapes







Various graphics and colors combinations are made on different models to see the differnce.

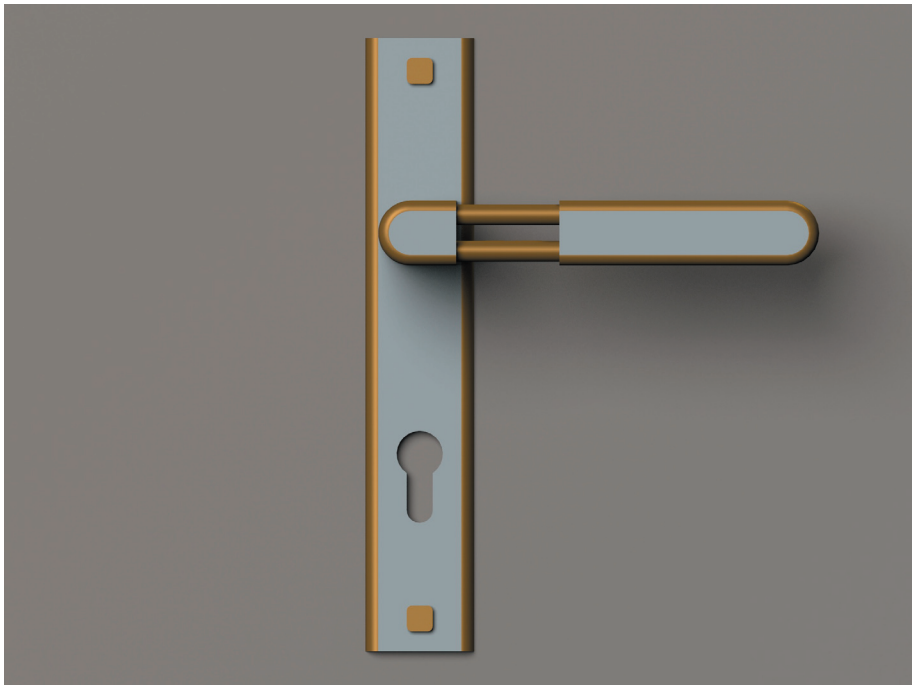
Visually continuity is remained unchanged with the highlights of the borders of the handle.

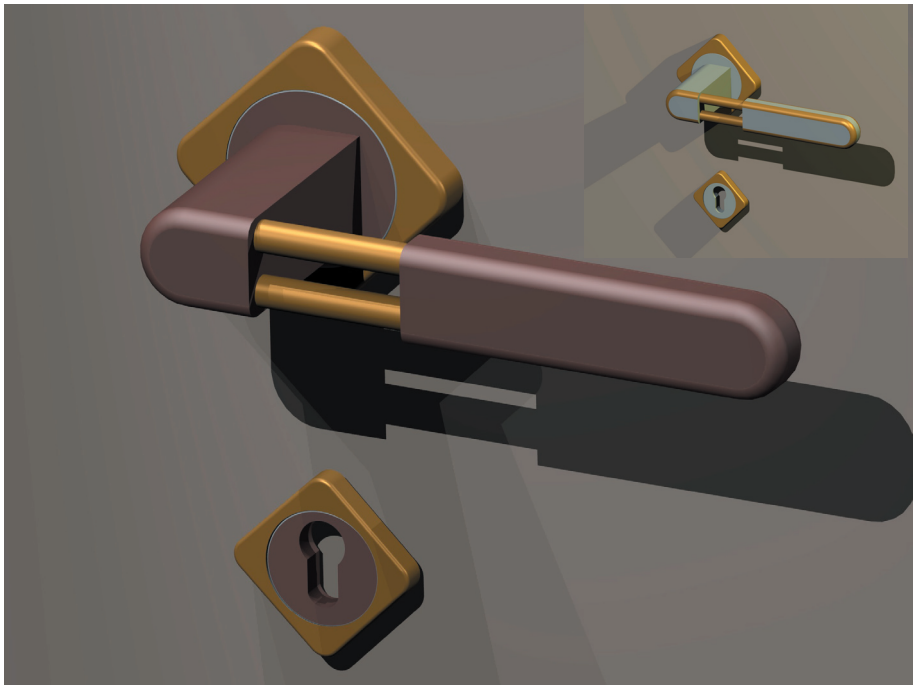
Rod Shapes

The length of the end cap is optimised visually as well as according to the usuabilty. The interaction part is coved with end cap which gives good griping for the hand.

Covers for the screws are made which are also made as a part of form.

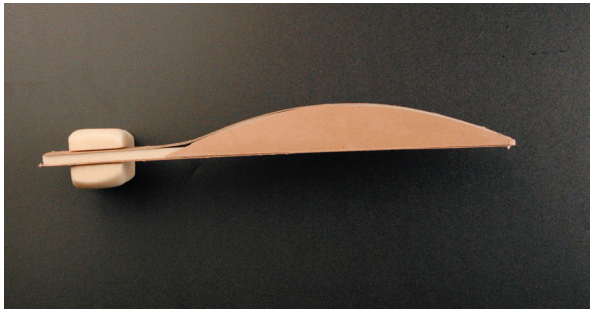
All the forms of the handle are brought into extruded rod shapes. Even the knob rod is also an extruded shape.





Sheet / Flat Shapes

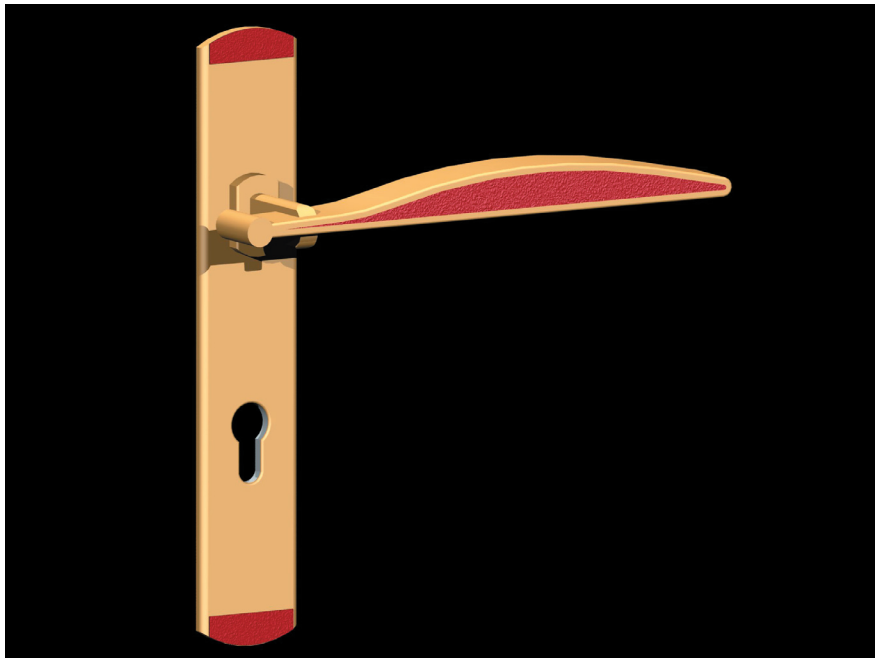
Mockup Model

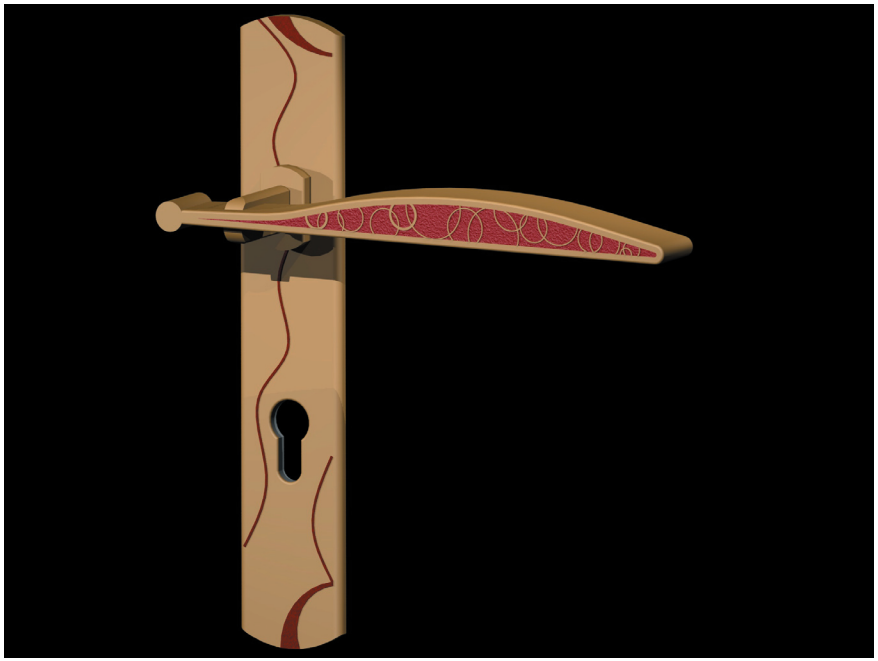


Finished in brass or chrome, the overall effect of each piece is one of perfect balance, as in the door handle, which fuses a dramatically extended lever to a simple over shaped rod.

Visually intersections of circles and flat plate mediates between the form of the hardware and the door itself, activating the whole in subtle ways.

Taken individually or as a collection, the hardware embodies assertive design and welcoming function

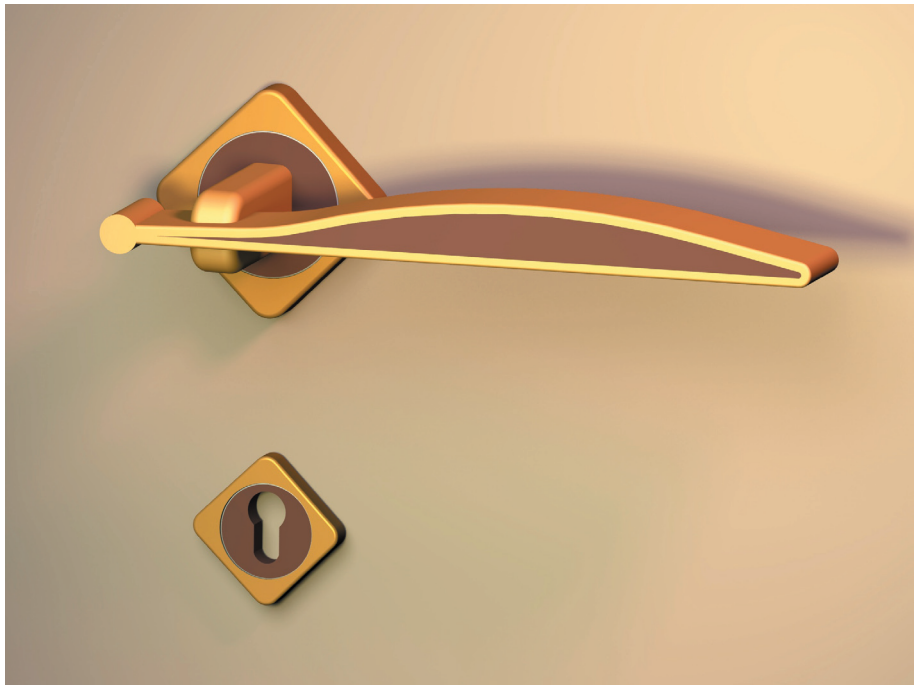




Sheet / Flat Shapes

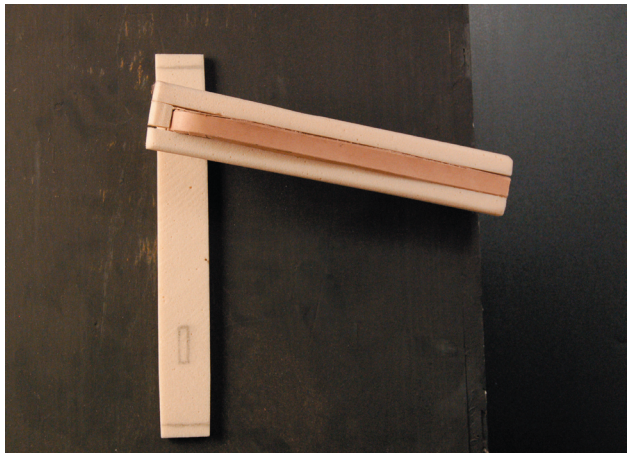
Primarily the handle will be a sheet metal which is bend and welded with other parts of the handle. Ends of the sheet which highlights the lines of flow increases its sleekness.

Concept Combi pack as well as rose set mortise locks are shown in the below images.



Solid Shapes

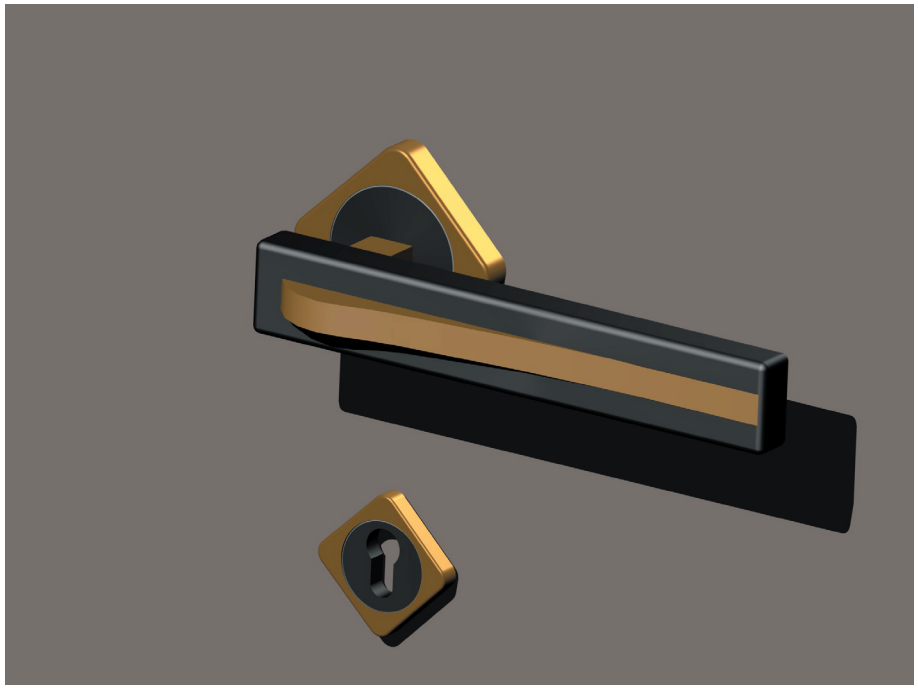
Mockup Model



An unsually effective and simple in form, with its refined grace exhibits elegance. Visual stimuli is brought in the form with the use of minimal colors and color of pure material in constrast with other shaded color.

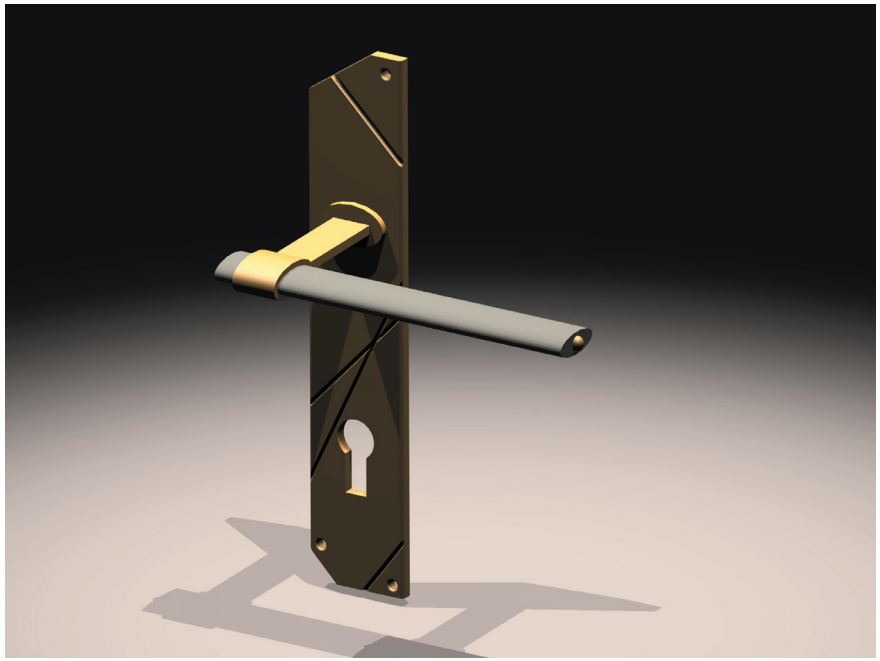
Solid Shapes

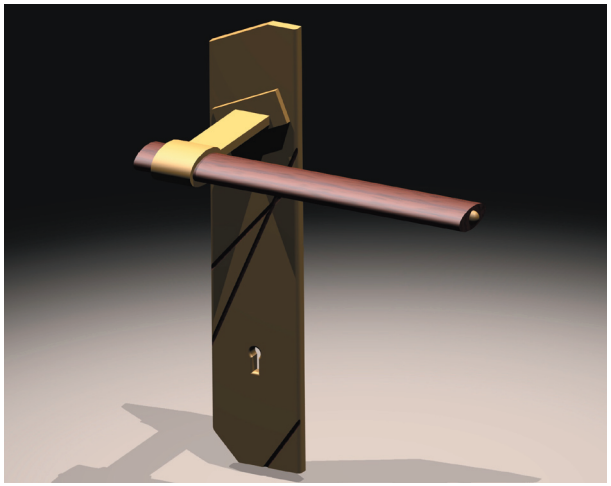
Combii pack and Rose set with the same handle are shown below.



Rod Shapes

This concept is placed in postmodern zone as the form shows some disturbance, unusuality. Intersecting lines with non orthogonal on the backplate is balanced by the regular oval shape and clean surface on the door handle. It seems the handle is holded with the hand.

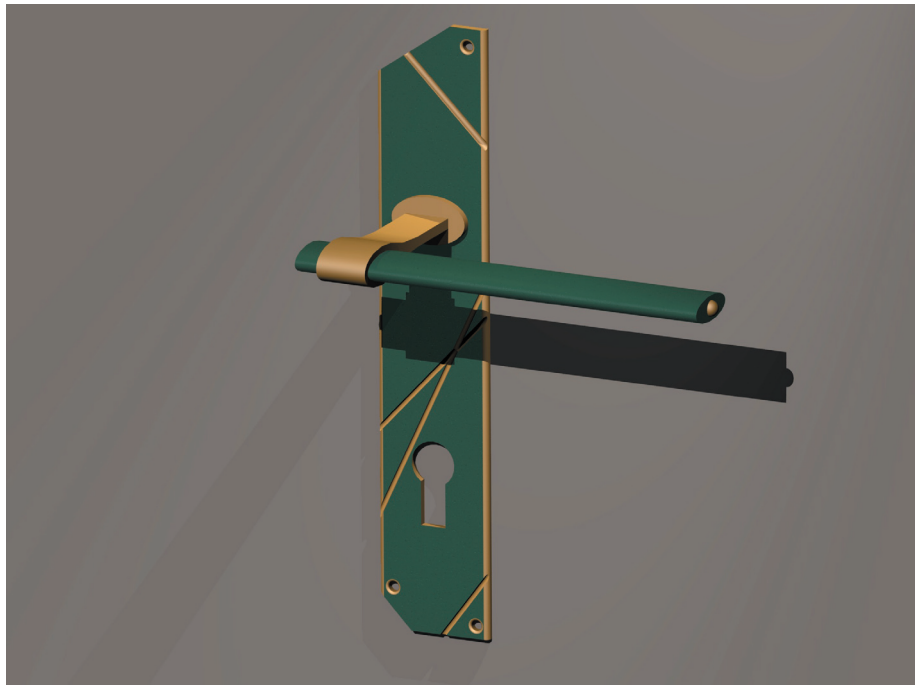


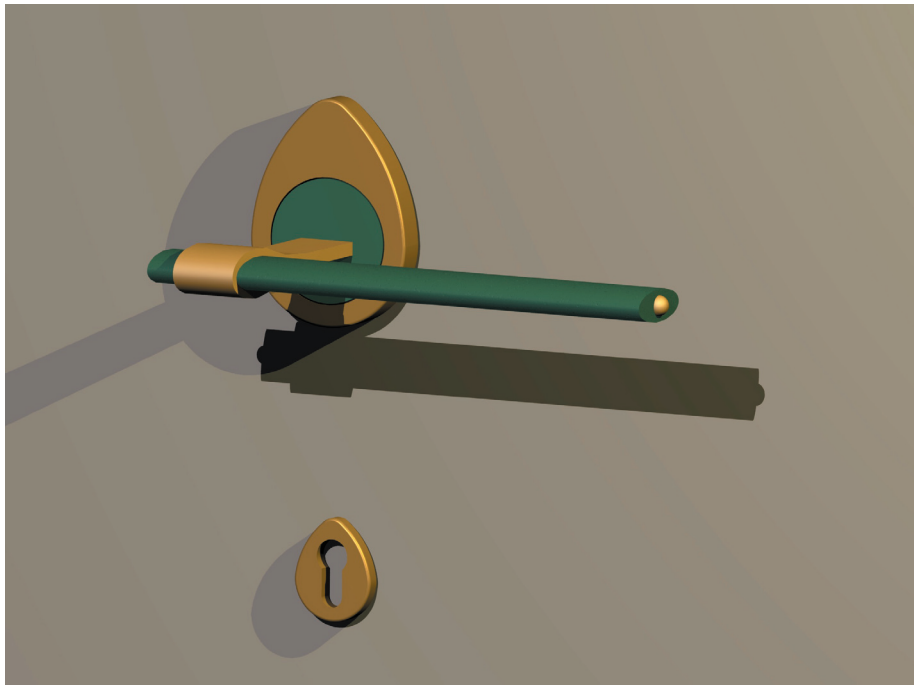


Rod Shapes

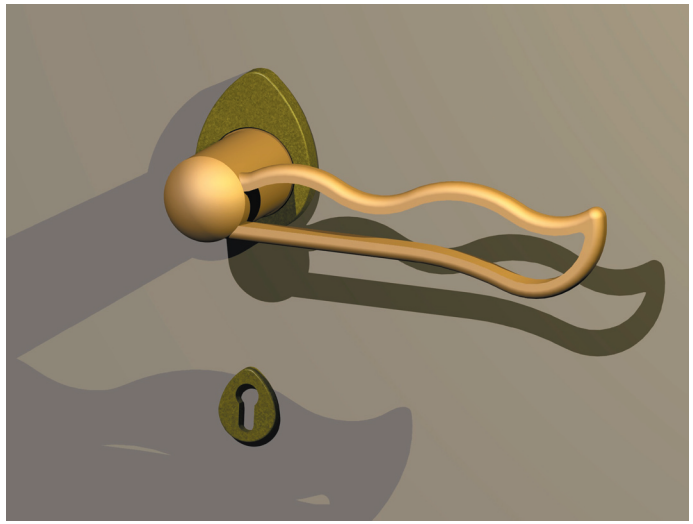
This concept has a mix of materials i.e., handle can be in plastic or plastic coated on a metal or it can be a granite stone or wood. And the rest is thought in Satin finished brass.

Both the rose set and combi pack mortise locks are shown with common handle.





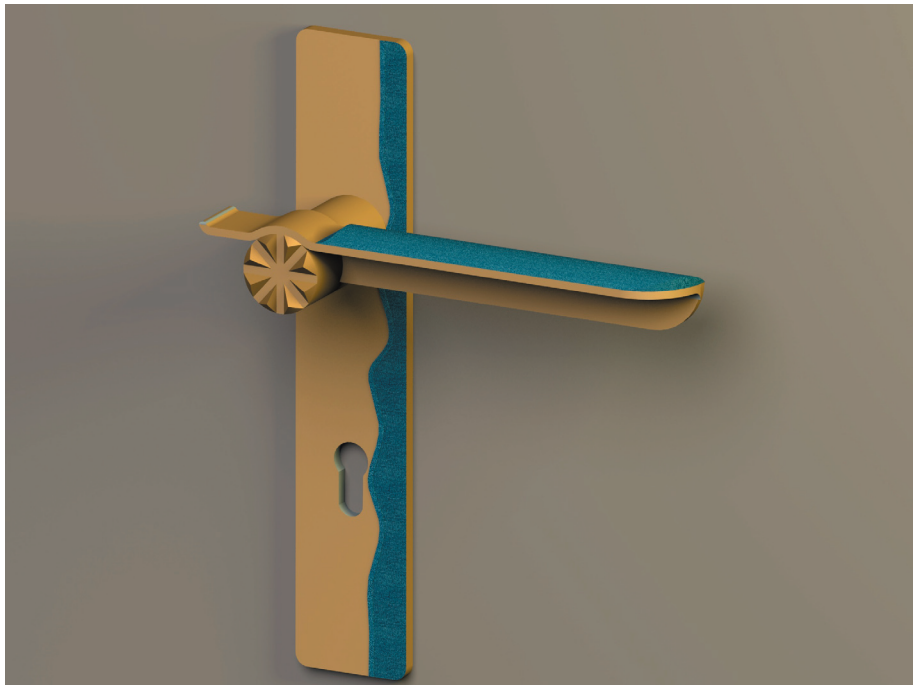
Sheet/Flat Shapes

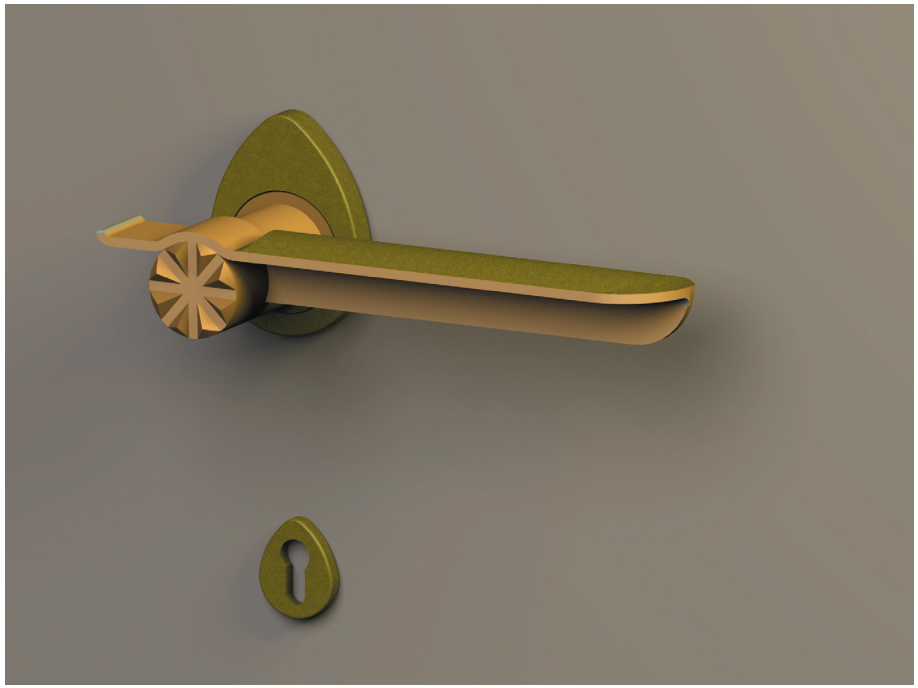


Abstraction of a canon is attempted in this concept with minimal use of sheet as a barrel and knob the wheel.

Fusing of graphical patterns into the door or visually made it has two parts with different materials. The combination of the colors of the graphical pattern and the metal shows postmodernity.

A rubbery grip or plastic material with a curved profile is fused onto the top of the metal of the handle so that it gives more confort for the use.

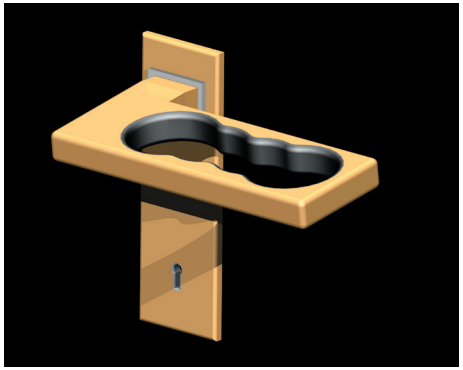


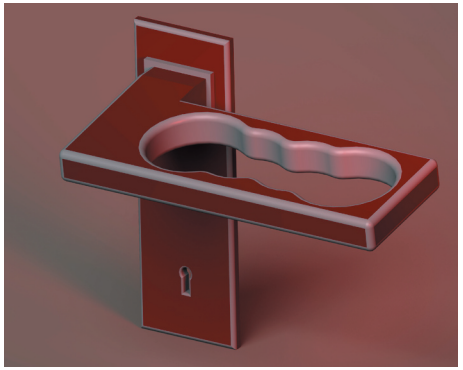


Concept 9: Solid Shapes

The negative space created in the handle recalls the profile of the fingers in a gesture of putting the hand into it and push down. The development of the concept has started with a small till at the join of knob rod and handle as shown clearly in the red model.

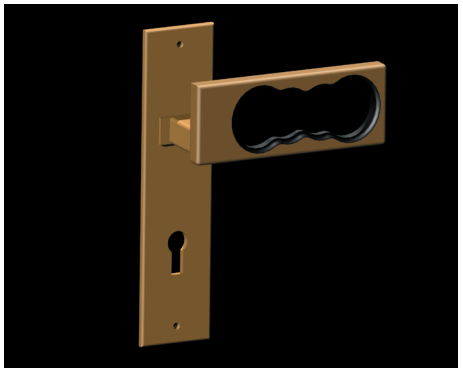
After making the mockup it has been reallised that user can access it faster as he/she does with the regular handle. So different options were made by making vertical and changing its position of joining with the connecting knob rod.

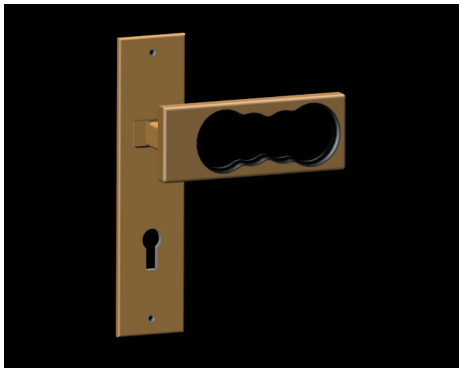




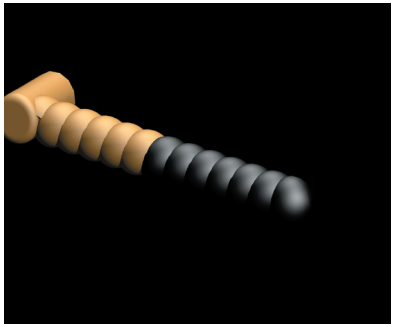
Graphics

Position of the handle



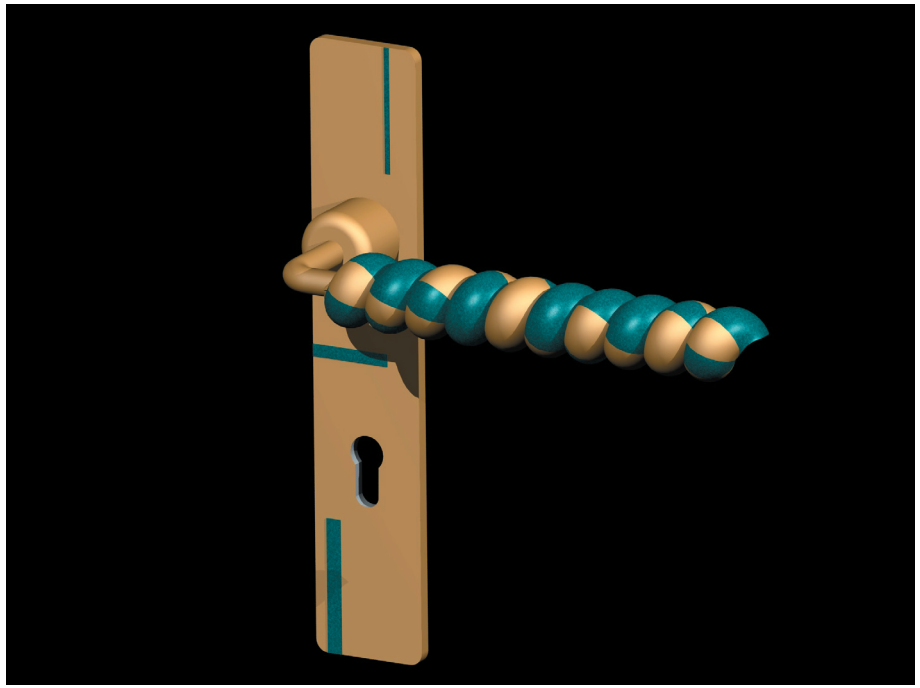


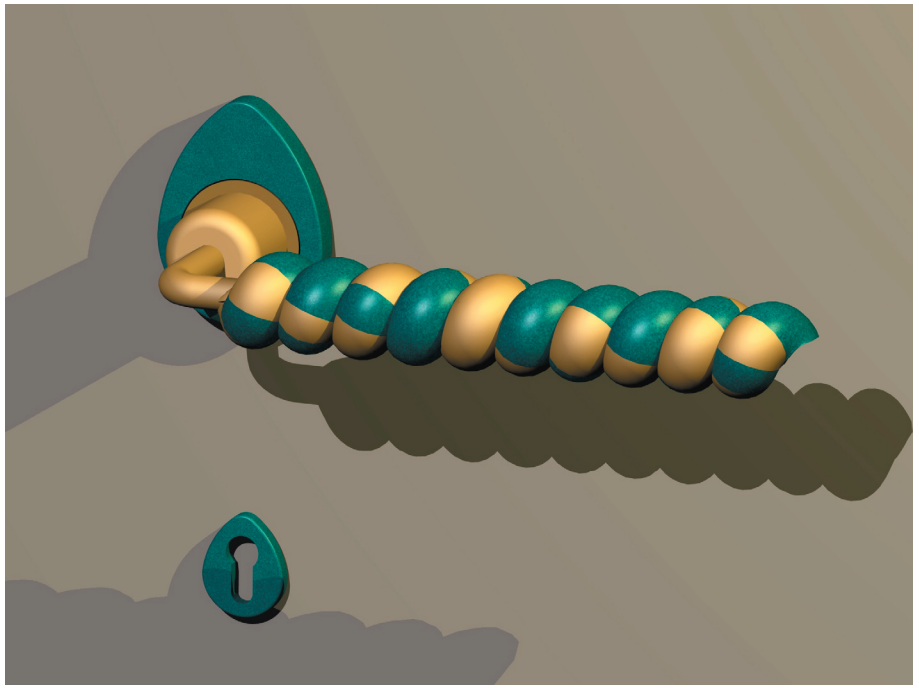
Solid Shapes

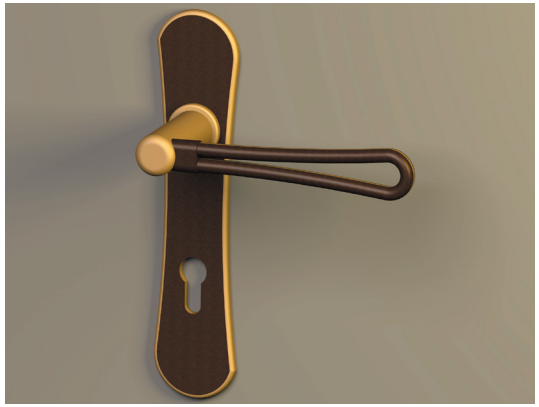
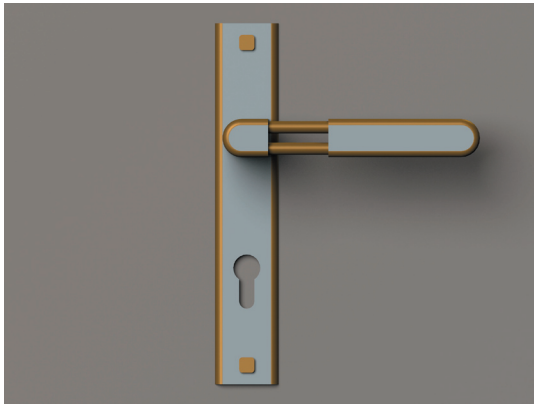
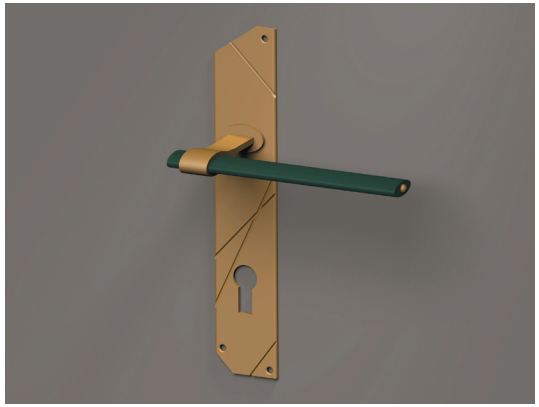
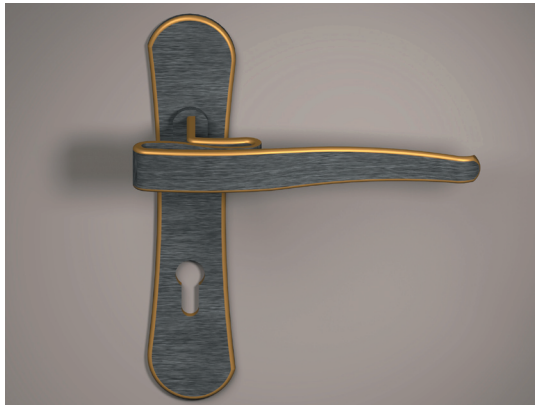


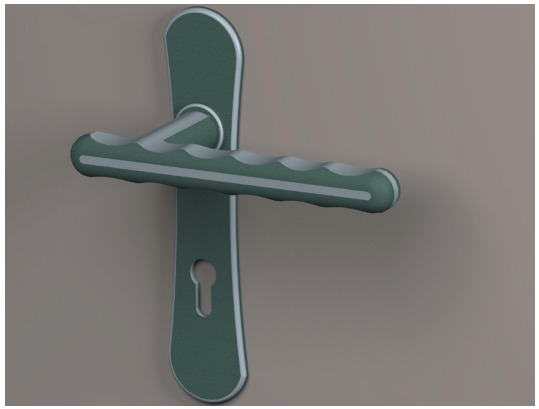
This is has choosen as 9th concept, as it has more surprise element with the spiral on the handle. The form for some look like an icecream on a stick, for some a rope winded around itself. With irregular graphics unsuality has been brought up.

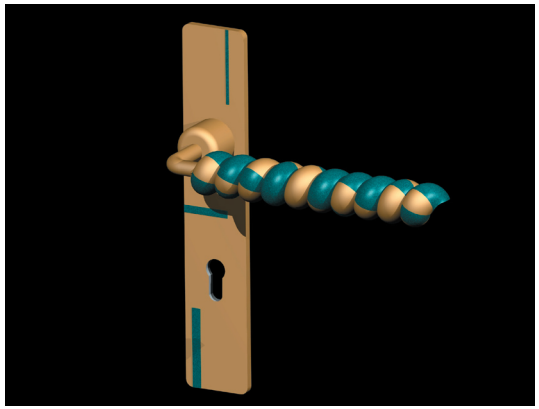
The handle can be in plastic or in casted brass. Below combii pack model as well as rose set model are shown.

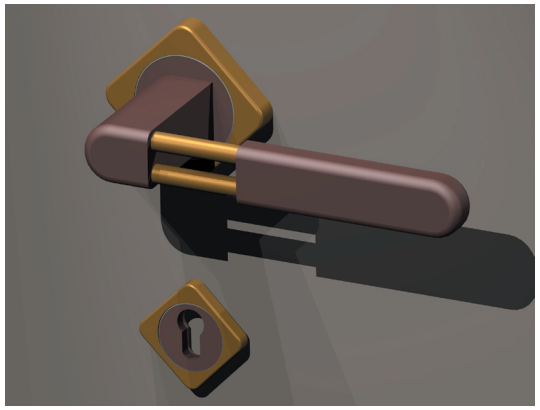
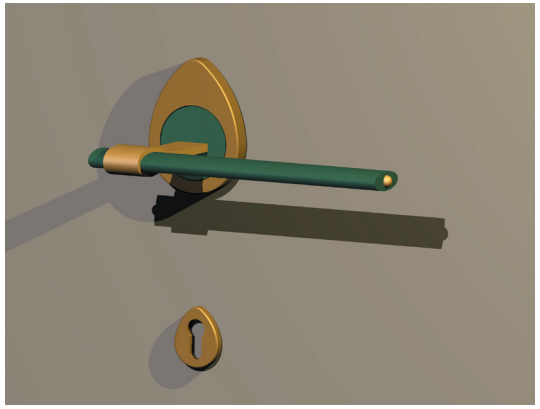
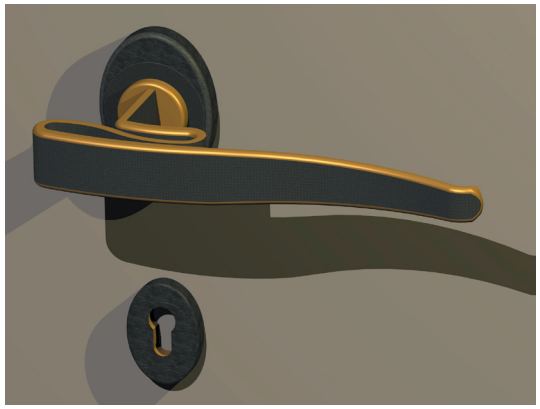
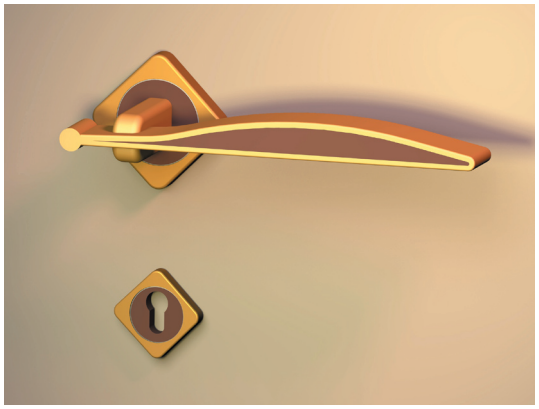
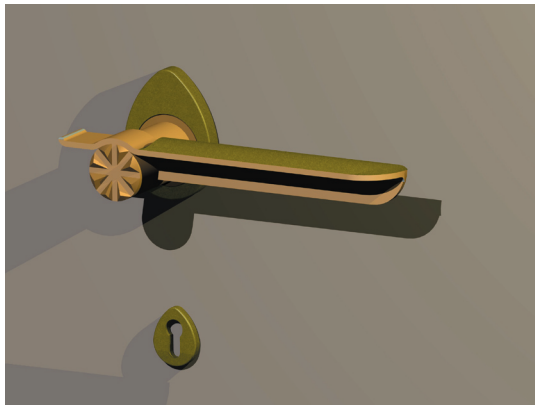
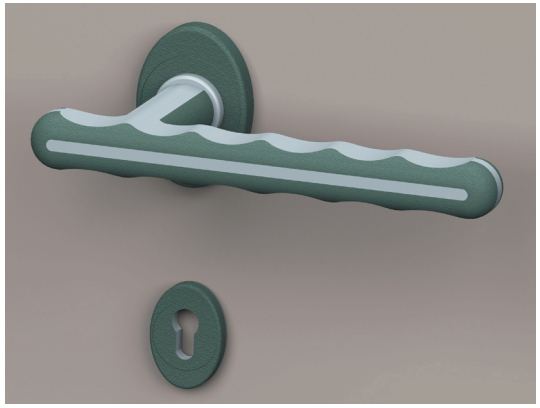
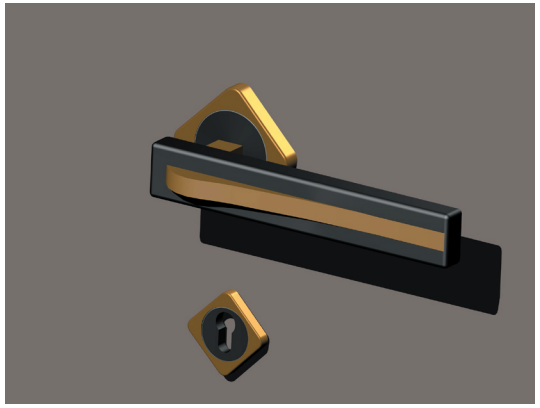
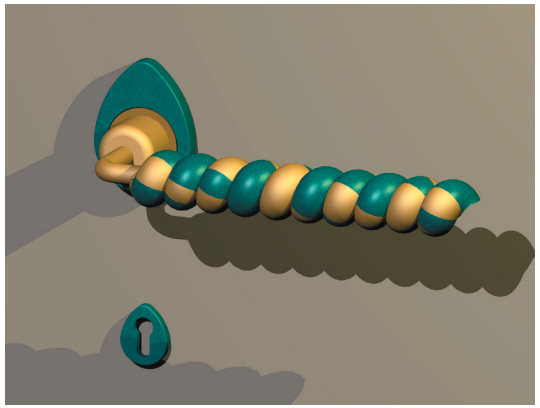






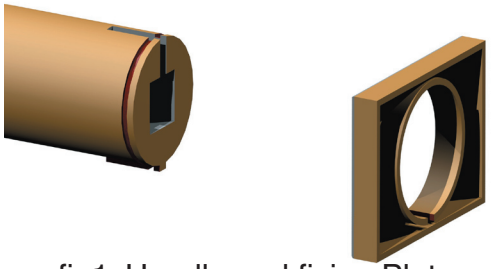


fig1. Handle and fixing Plate

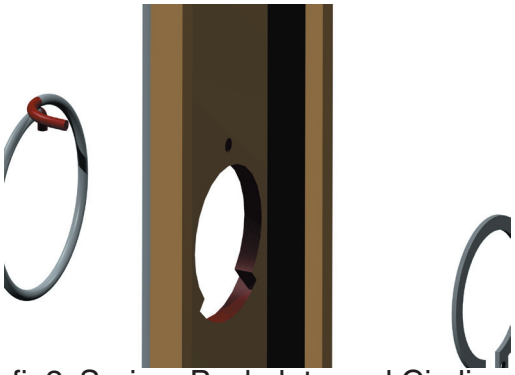


fig2. Spring, Backplate and Circlip

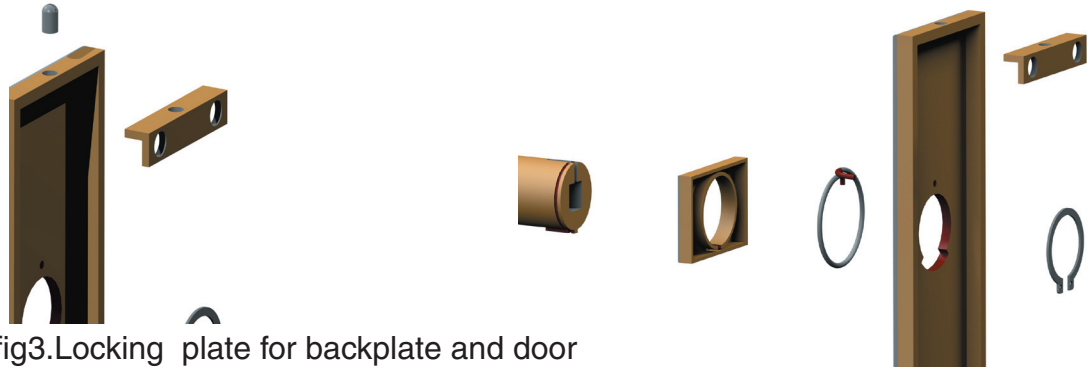


fig3.Locking plate for backplate and door

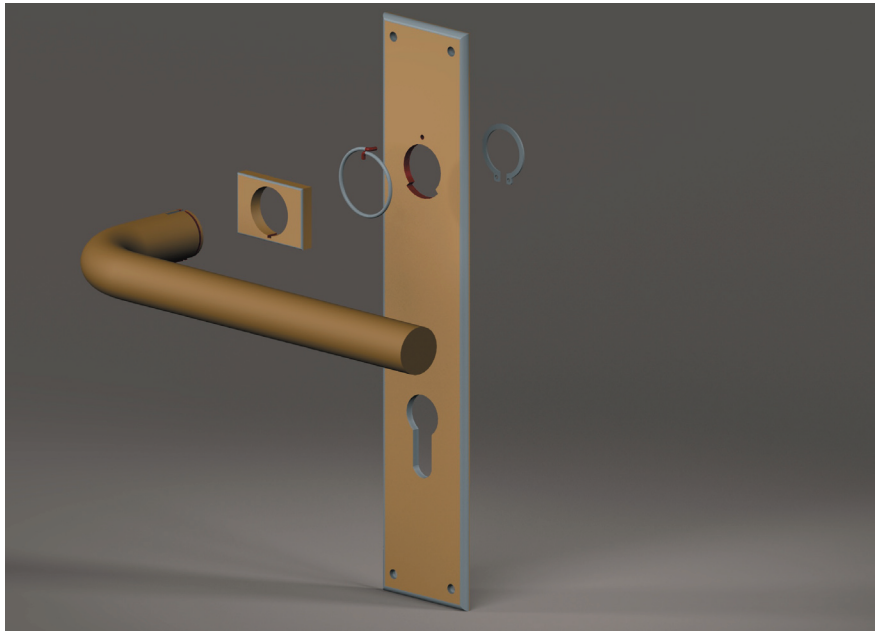
The mechanism of the fixing of handle to the backplate and backplate to the door are redesigned to bring some more aesthetic look. Removed visibility of screws from the front by provin a fixing plate inside the back plate.

The position of the fixing plate is changed and brought to the front and fixed to the handle as shown in fig1. This plate will also rotate with the handle as it is locked to the handle with the help of a key in a keyhole provided on both handle as well as in the fixing plate.

On the handle a groove for the circlip is remaind unchanged. In between circlip and backplate a nylon washer will come for lubrication.

The back plate is fixed with the help of link plates shown in fig 3. which will be fixed to the door and as well fix the plate with a grub screw.

Full assembly is shown in the below figures. Screw holes in the last figure are shown but they are eliminated in the new design.

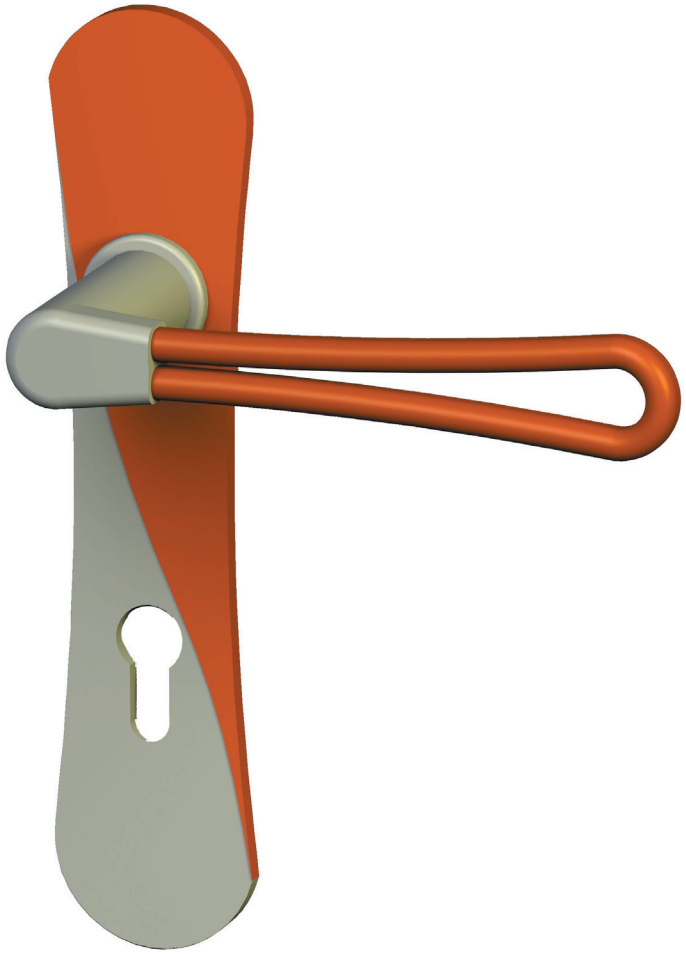


In the lifestyle category a range is very important to generate market as well as satisfy a wide variety of user preferences. The three range proposed specifically keeps in this aspect in mind. Each range has been tried in all the three manufacturing processes predominently rod based, sheet folding based and solid form based.

The playful range would appeal to the youth which has a completely new look and feel.

The elegant range would mainly appeal to the middle aged user who want a handle but at the same time wanted to look different.

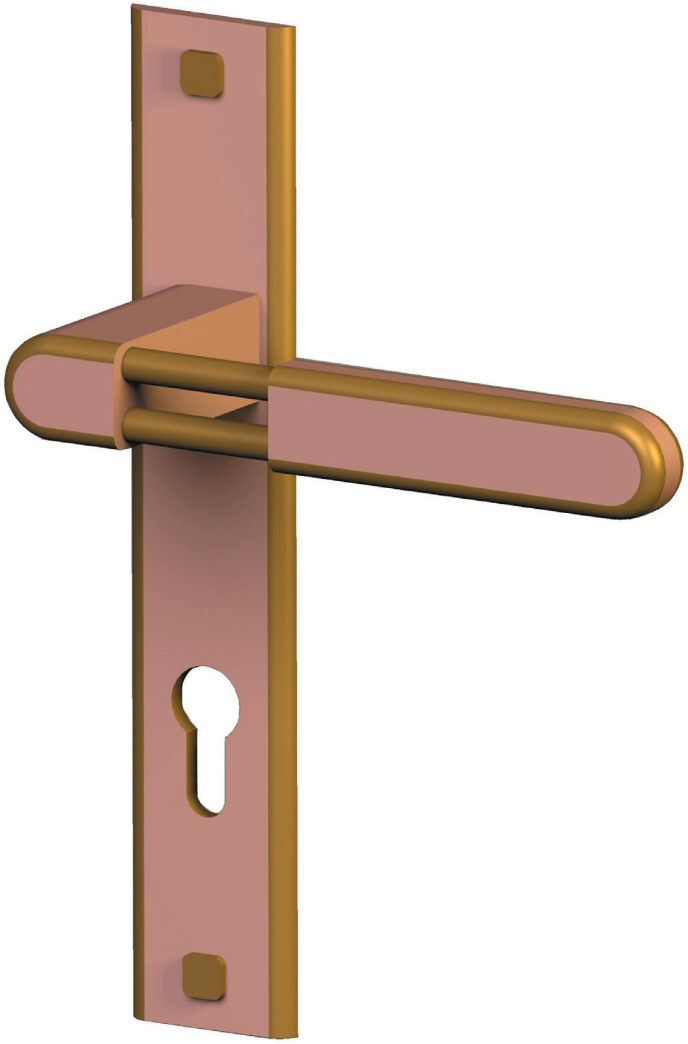
The third range, the theme is postmodern which will appeal to the designers and architects who want to create surprise and differentiation by using the same.



RENDERED IMAGE

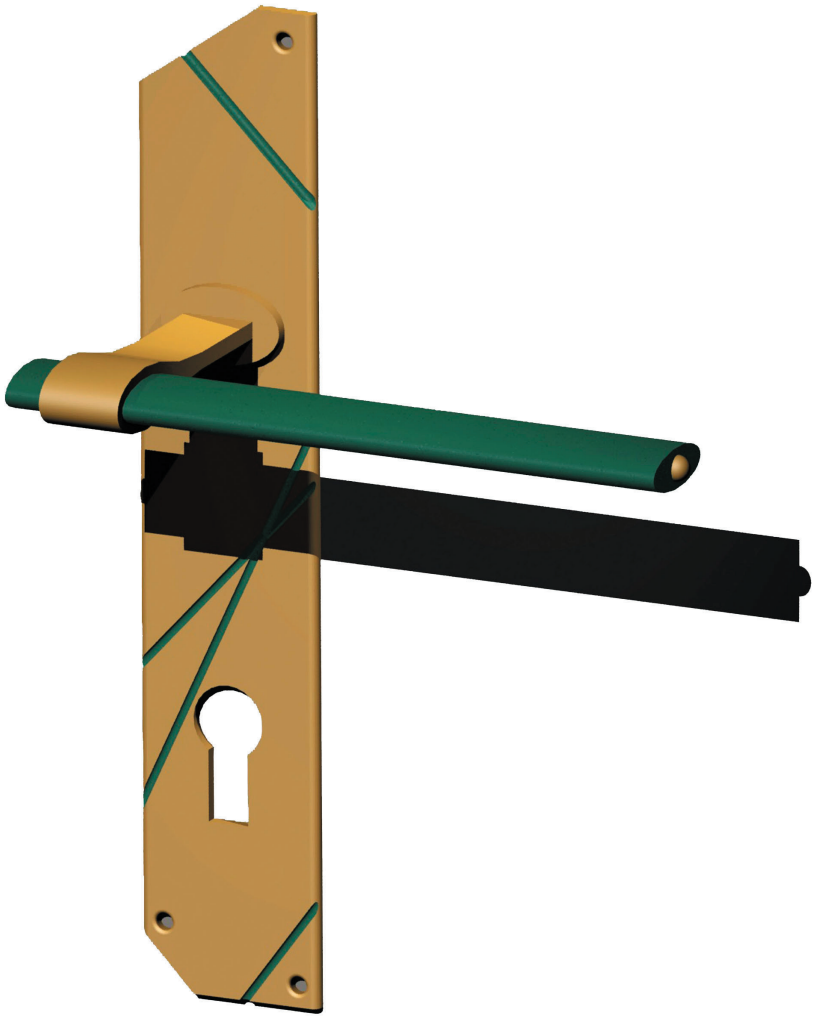
MODEL

ROD SHAPED FORM - ELEGANT



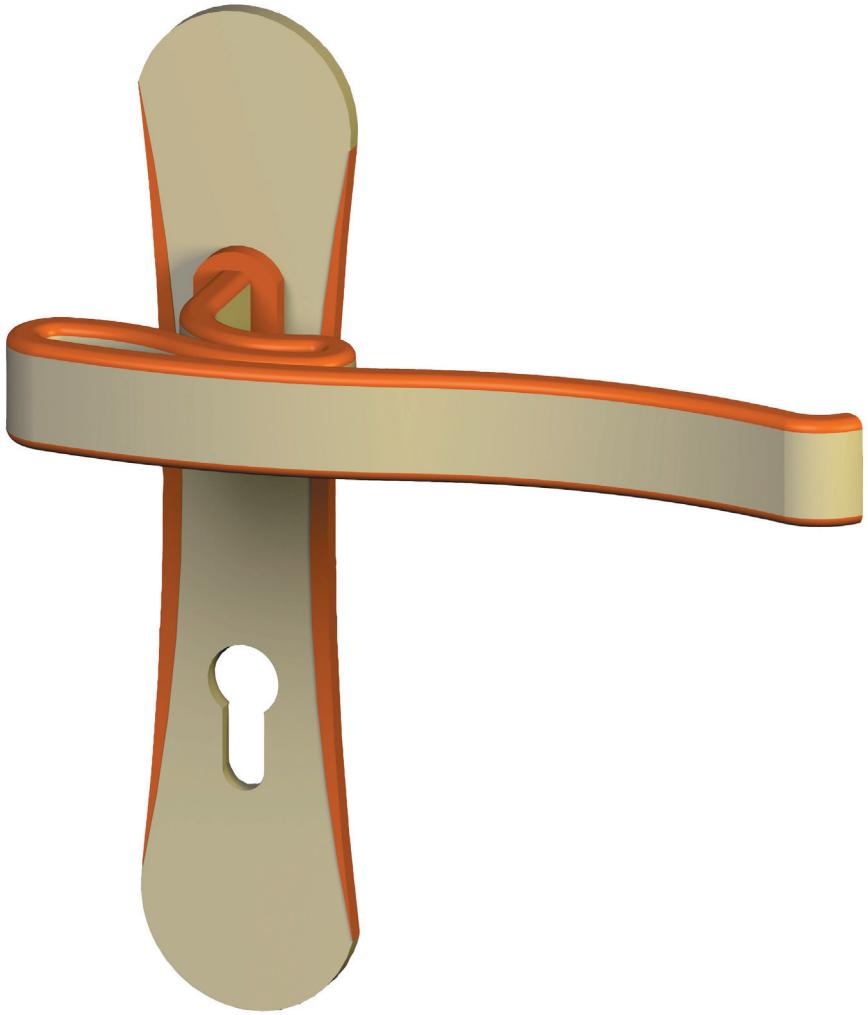
RENDERED IMAGE

MODEL



RENDERED IMAGE

MODEL

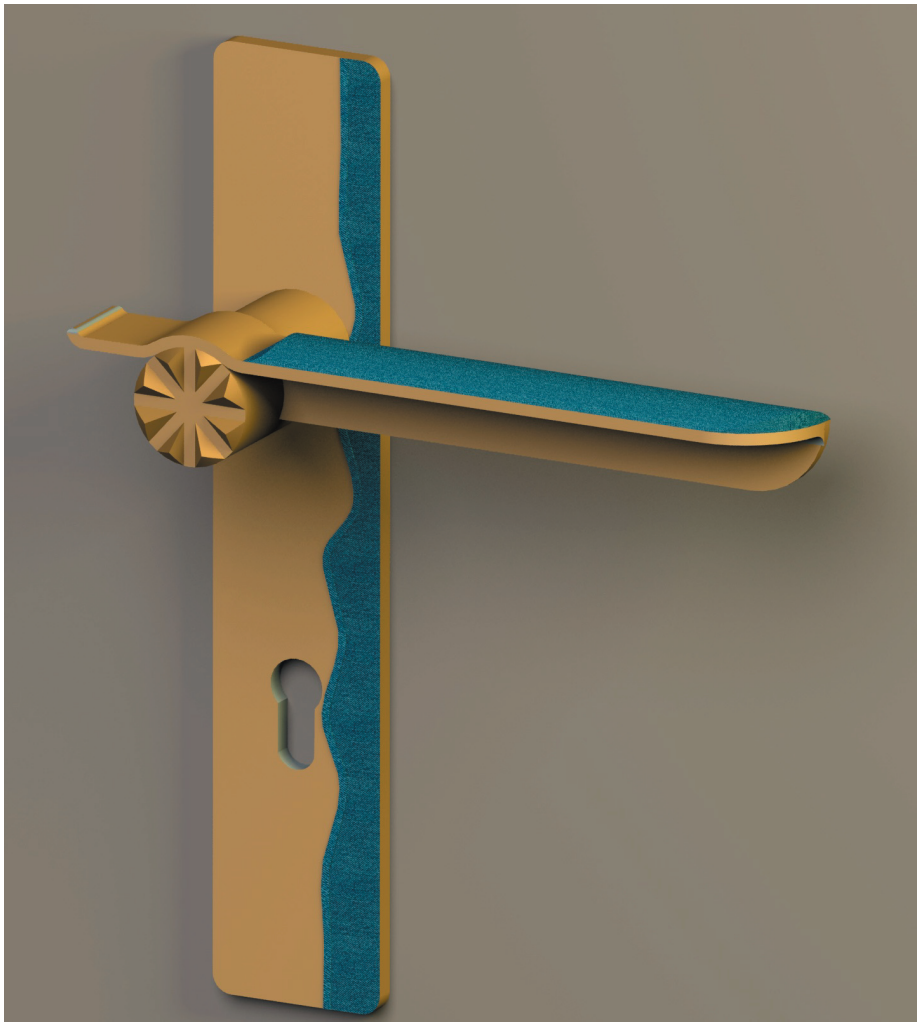


RENDERED IMAGE

MODEL

RENDERED IMAGE

MODEL



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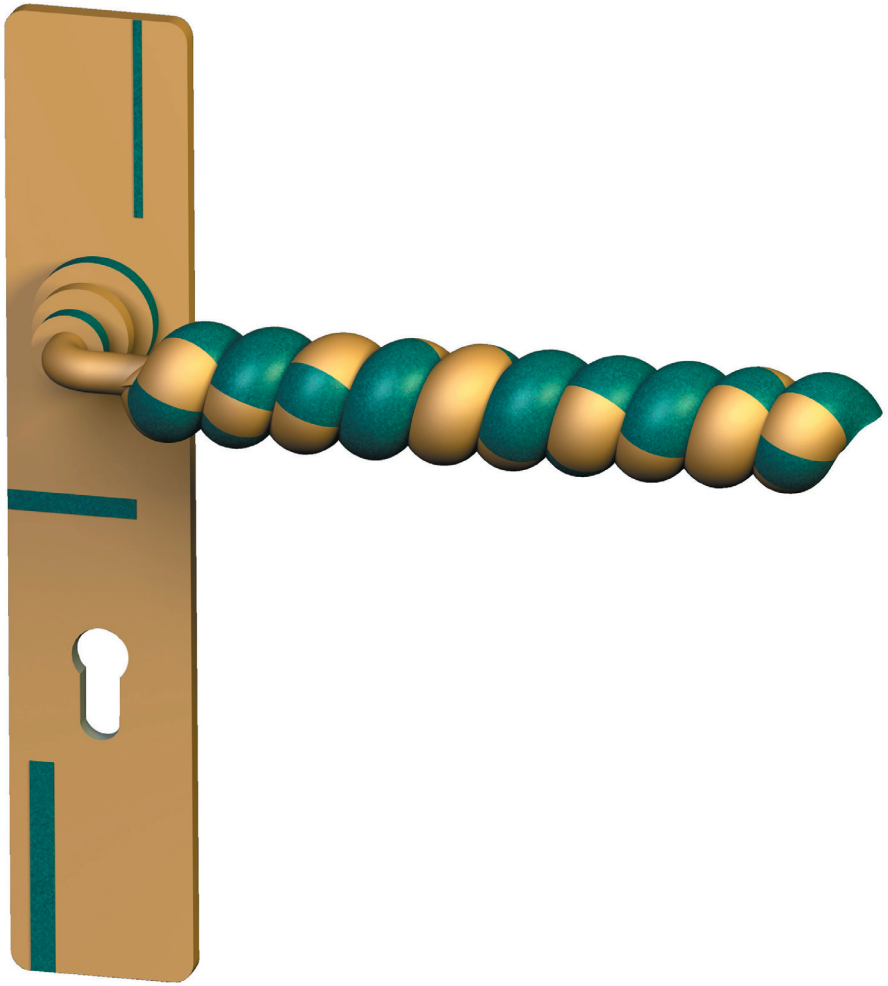


RENDERED IMAGE

MODEL

Books and Desertations

- Redesign of the vertibolt
  Shyam Narayan V - 2002 - *IDC, IITB*
- FORM
  Magazines

Web Resource

http://www.godrejlocks.com
http://www.godrejlocks.com/GodrejNew/Templates/Locks/SecurityAdvisor/securityAdvisor.htm
http://www.forms-surfaces.com/
http://www.villeroy-boch.com/Lifestyle.7.0.html?C=DE&L=en
http://www.fixturesetc.com/Cabinet_knobs.htm
http://www.videojug.com/tag/diy
http://www.fab.cz/catalogue/how-to-make-the-right-choice
http://www.sargentlock.com/documents/
http://www.architecturalantiques.com/doorswood.htm#Glass%20Insert%20Doors
http://www.dir.ca.gov/dosh/dosh_publications/handtools.html
http://www.lockworld.com/manufacturers.htm
http://www.designlager.de/
http://www.erbutler.com/
www. chantproductions.co.nz
www.google.com
www.wikipedia.com
www.stumbleUpon.com
http://www.designinsite.dk/htmsider/inspmat.htm

Finishes

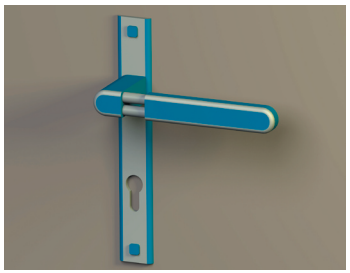
www.geplastics.com
www.inclosia.com
www.duluxpoweders.com.au
www.sericol.com
EPA, US
http://www.northeastcoating.com/PVDvsElectroplating_1.htm

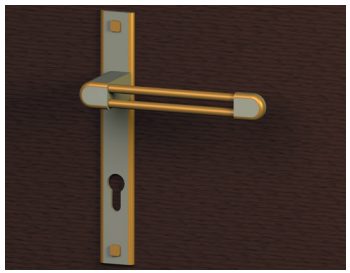
Ergonomics

http://www.dir.ca.gov/dosh/dosh_publications/handtools.html; www.mcmillan-scott.com
http://www.technologystudent.com/index.htm; http://ergonomics.uq.edu.au/eaol/handle.pdf

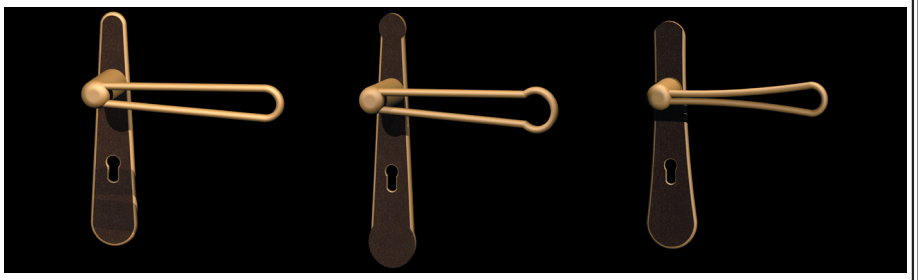
Visual Product Testing

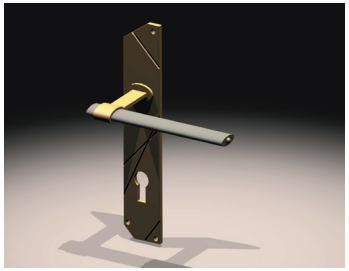
Elegant – Extrude	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	7	8	Full cover, pale cream	Very **Delicate**, Easily get **bent** with small shocks, area of application should be indoor only, holding grip is very less
Sub 2 (Age: 26,m) Student, Civil Engg	7	7	Full cover, blue	Very delicate and can be bent. Color makes difference
Sub 3 (Age: 24, m) Student, Mech. Engg	7	7	Full cover, gold and cream	Manf. process increases, Can be broke easily
Sub4 (Age: 25) Student, Comp.Sc.	9	9	Full cover, all colors	Less delicate.
Sub5 (Age: 40,m) Bussiness	9	8	Full cover, metallic color	May be delicate
Sub6 (Age: 35,f) Software professional	9	8	Full cover, brass color	If it brass its ok



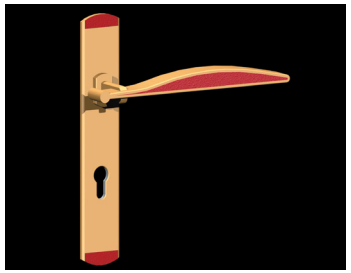


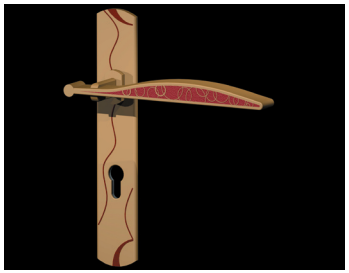
Playful - Extrude	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	7	8	Plain 1st and 4th	Very **Delicate**, Easily get **bent** with small shocks, area of application should be indoor only, holding is difficult Rich(curled)
Sub 2 (Age: 26,m) Student, Civil Engg	8	8	Plain, 1st and 4th	Very delicate and can be bent. Can be diff. to hold, Color makes difference
Sub 3 (Age: 24, m) Student, Mech. Engg	7	6	Plain, knurled (Knurled), Selected 4th and 6th	Very difficult to hold, manf. process increases, Can be broke easily
Sub4 (Age: 25) Student, Comp.Sc.	9	8	all colors 1st, 4th and 6th	Less delicate
Sub5 (Age: 40,m) Bussiness	9	7	4th	May bend
Sub6 (Age: 35,f) Software professional	9	8	4th and 6th	If it brass its ok





Postmodern-Extrude	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	8	8	Both	Delicate at joining to back place
Sub 2 (Age: 26,m) Student, Civil Engg	8	8	Wooden	-- do--
Sub 3 (Age: 24, m) Student, Mech. Engg	7	8	Wooden	--do--
Sub4 (Age: 25) Student, Comp.Sc.	8	9	Both	Good
Sub5 (Age: 40,m) Bussiness	9	8	Both	Good
Sub6 (Age: 35,f) Software professional	9	8	Both	Ok

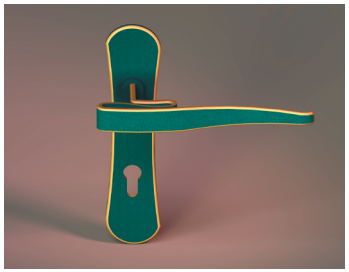




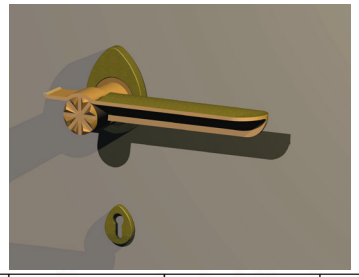
Elegant – Sheet	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	8	8	Without graphics	Looks weak at the joint
Sub 2 (Age: 26,m) Student, Civil Engg	9	8	Without graphics	Its ok
Sub 3 (Age: 24, m) Student, Mech. Engg	8	7	Without graphics	Nice
Sub4 (Age: 25) Student, Comp.Sc.	8	8	With graphics	V.nice
Sub5 (Age: 40,m) Bussiness	8	7	Plane	Nice
Sub6 (Age: 35,f) Software professional	8	8	Plane	good

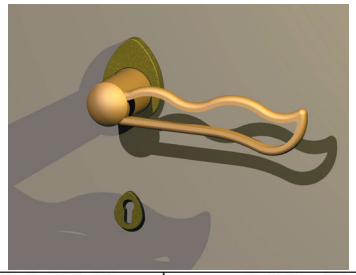
Visual Product Testing

Playful - Sheet	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	9	9	Plain without texture	Holding is difficult, thickness problem
Sub 2 (Age: 26,m) Student, Civil Engg	8	8	Plain without texture	-- do --
Sub 3 (Age: 24, m) Student, Mech. Engg	7	6	Plain	Holding is difficult, thickness problem
Sub4 (Age: 25) Student, Comp.Sc.	9	8	All colors	Very nice
Sub5 (Age: 40,m) Bussiness	9	7	Plain	Very new, holding have to be checked
Sub6 (Age: 35,f) Software professional	8	9	Silver color	Good



Postmodern-Sheet	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	7	7	1st	Holding problem, end point
Sub 2 (Age: 26,m) Student, Civil Engg	7	7	Both	Holding problem
Sub 3 (Age: 24, m) Student, Mech. Engg	7	7	1st	Holding
Sub4 (Age: 25) Student, Comp.Sc.	8	8	1st	Good
Sub5 (Age: 40,m) Bussiness	7	7	1st	Good
Sub6 (Age: 35,f)	9	8	1st	Good but holding has to be checked



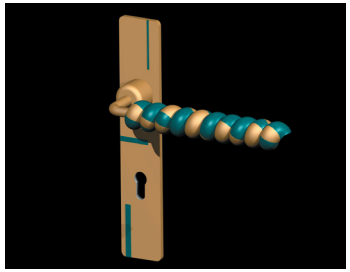


Elegant – Solid	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	8	8	Ok, but mechanical	Edges may hurt children
Sub 2 (Age: 26,m) Student, Civil Engg	7	7	Ok	Not much interesting, some more colors
Sub 3 (Age: 24, m) Student, Mech. Engg	8	8	Fine	Nice, fine with colors
Sub4 (Age: 25) Student, Comp.Sc.	8	8	Fine	V.nice
Sub5 (Age: 40,m) Bussiness	9	8	Fine	Nice
Sub6 (Age: 35,f) Software professional	9	8	Fine	Good

Playful - Solid	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	8	8	Good, gold	Noting, Nice
Sub 2 (Age: 26,m) Student, Civil Engg	8	9	Florescent	-- do --
Sub 3 (Age: 24, m) Student, Mech. Engg	9	9	Both	Nothing, very nice
Sub4 (Age: 25) Student, Comp.Sc.	9	8	Both	Nothing, very nice
Sub5 (Age: 40,m) Bussiness	9	8	2nd	Nice
Sub6 (Age: 35,f) Software professional	9	8	1st	Good

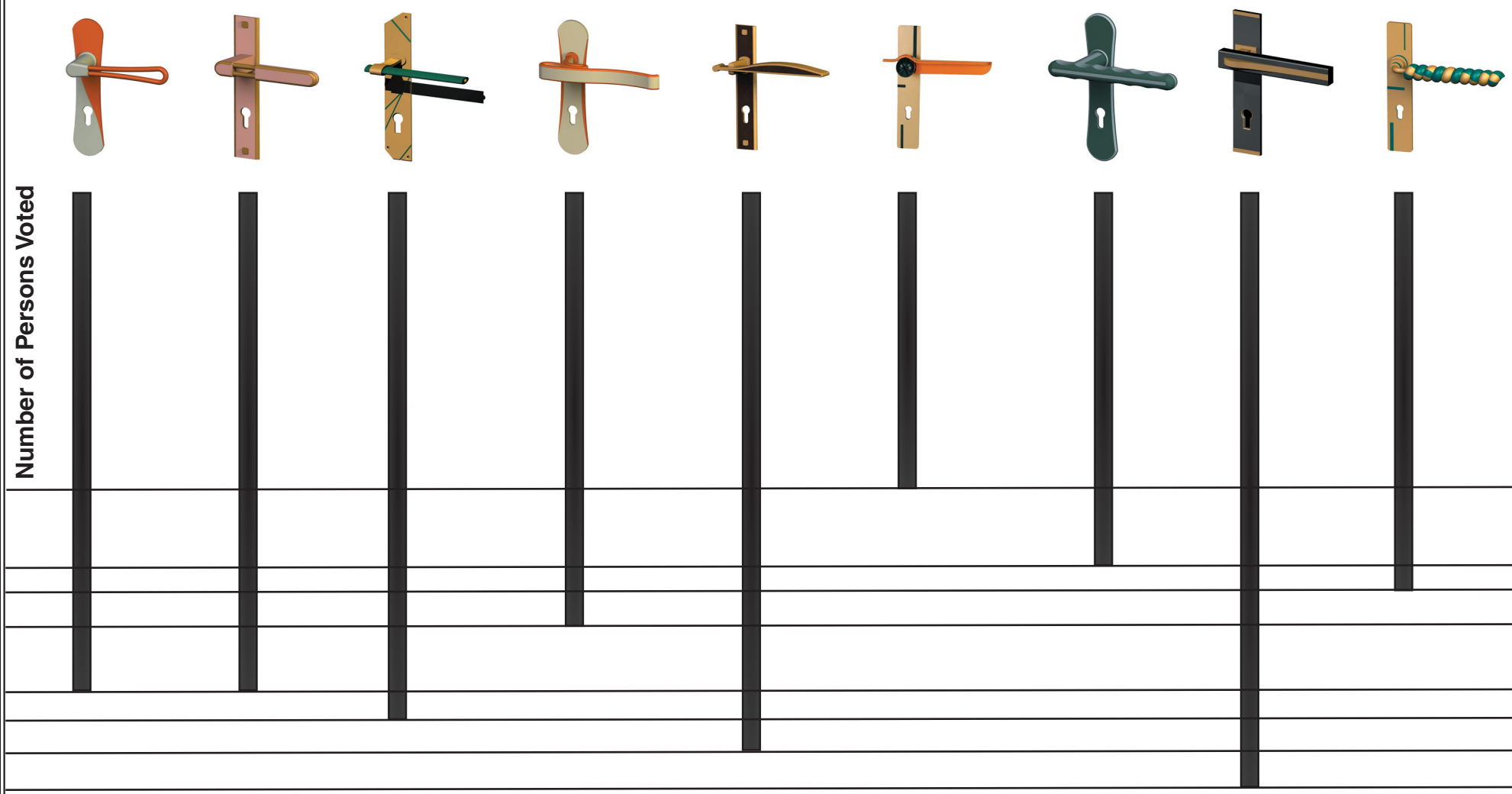
Visual Product Testing

Postmodern-Solid	Form (0-10)	Aesthetics (0-10)	Selected Model	Problems Identified
Sub: 1 (Age: 24,f) working professional	9	9	2nd, 1st horz.	1st model: hand may hurt if inserted in hurry
Sub 2 (Age: 26,m) Student, Civil Engg	9	9	2nd	-do-, liked graphics
Sub 3 (Age: 24, m) Student, Mech. Engg	9	9	2nd	-do-
Sub4 (Age: 25) Student, Comp.Sc.	9	9	Both	-do-
Sub5 (Age: 40,m) Bussiness	9	8	2nd	-do-
Sub6 (Age: 35,f) Software professional	9	7	2nd	Not easy to put your hands



User Feedback

- Brass mortise handles are identified as Godrej's product.
- It should give feel of secure.
- Visually the joints has to be strong which are looking delicate in some designs.
- Young aged grouped like the drastic changes in the handle form
- Middle aged grouped people liked the simple design, they bored about the length of the handle which is increased
- In some designs sharp edges are found out.



Total Number of Perons : 177