

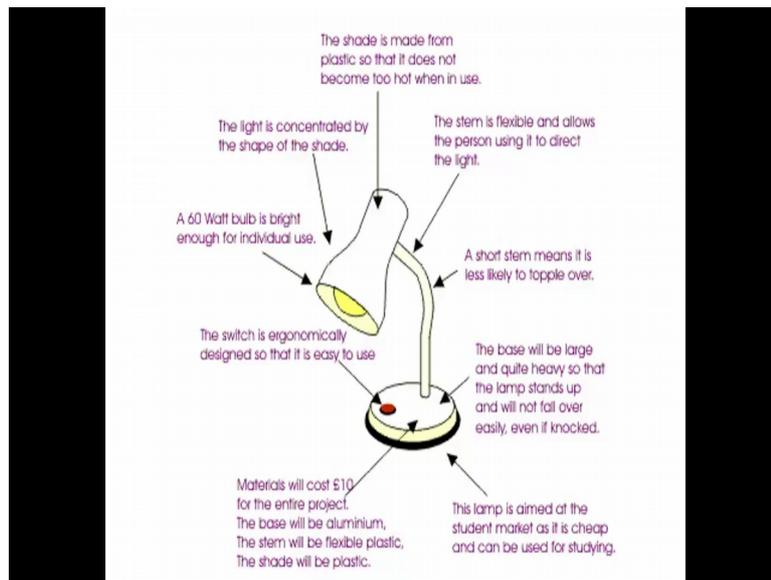
Enclosure Design of Electronics Equipment
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Lecture – 08
Enclosures to Product design

Good morning friends allow me to continue from where I left of yesterday, the main topic that was covered yesterday is that you should have a way of conceiving a product some concept development and a way of expressing it to your group members. We have an issue about it whether you are planning get together otherwise we are planning to do something in your own group or anything you notice it people have different views in the way we express them in words guess titillations that is your body language, and I do not know maybe the way the syntax all these does not get carried as well as we wanted in what we wanted to say is not exactly what we say finally, whenever words.

Now, have a different effect on another thing unlike this if you have a visual method of presentation like typically a sketches and all that with a little bit of explanation, you will notice that the chances of your idea getting understood by others is very very high and second thing is as you are trying to sketch or as you are trying to make things will become clearer for you. The moment you wanted to write something you will know oh there is something this detail is missing, and then. So, if you can get back to my yesterdays that what you call that lamp exercise, you can see this lamp exercise very conveniently we have written.

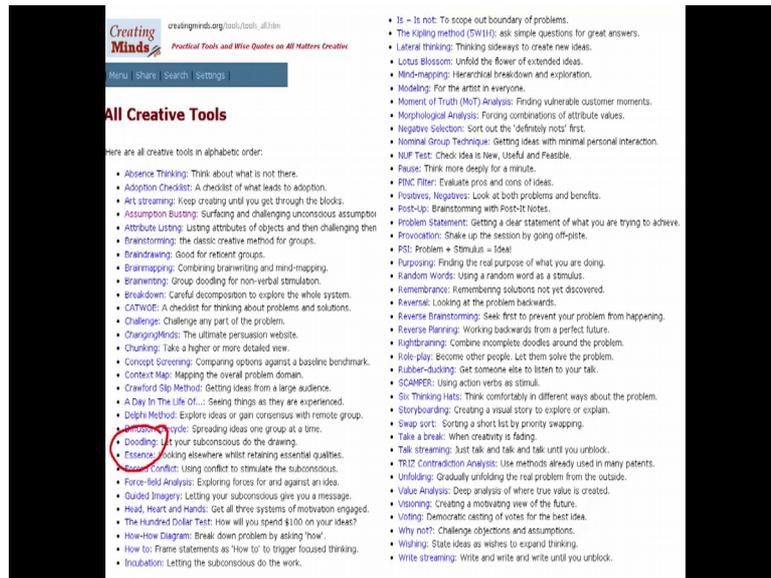
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Switch is ergonomically designed. So, that it is easy to use your little problem about it saying ergonomically designed strictly by definition of ergonomics it is about economy of energy saving and all that. So, does it make sense to have a rocker switch or is it does it make sense to have a push button here do I like to push it here. Now what if I press my you know push button from the top, then existing push buttons somewhere little longer than what we would like to use in that case. So, suddenly your things get clearer and clearer as you see and then you have seen that can be used for studying as it is pointed out, you will notice as it is pointed out it is notice that there is a black thing here probably it is a black rubber.

Which has been added subsequently saying wait is one thing wait is the one base will be large and heavy weight is one thing, and this anti skid small rubber will probably enhance the product much beyond normal usage. So, sketching helps us in trying to communicate and also clarify our own ideas.

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If you remember I left your last saying that you should see this creativity tools. So, if you go to creating minds dot org which these things have been taken I would like to acknowledge the what you call good effort they have put in trying to maintain these things, we have a large number of you see here we have a very large number of techniques that are used here.

So, one of them is this doodling let your subconscious to the drawing. So, the next slide talks to about what is it when do you use it use at any time you want to think a little creatively not in a specific creative environment. So, it looks funny, but me and lecturer trying to tell people probably sitting in a classroom, may not be the most creative thing when you have to concentrate what the teacher is saying deliberate creative tool. So, the issue is saying you can do it anytime there is no issue of what it at all, and then other it benefits are there now coming back to that slide here.

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So, many of these things are listed here, and each of this is also a little explained here it is up to you to go and see what best you can make out of it. Now I will get back to one of the examples which I have taken yesterday about this lamp, now if you can have a look at this beautiful LED based table lamp first of all one of the first things it is too light chances are it will trip, and then we said we can improve it dramatically by probably adding these cells in it that was exercise I suggested you do take this what is called 1 8 6 5 0 cells which are inside make your good estimate of how well these things can be packed inside and make something which is a little stronger and a little more stable and just before I have highlighted that maybe you just make it like this it is still not skid proof. So, can you put an anti skid some coating are something about it and then most of the places it seems to be quite alright. Only thing is one thing which I have deliberately avoided talking to yesterday is, we are forced to have a charging socket you see here I have a charging socket here, it has two things one of them is this charger socket utilizes a solar panel.

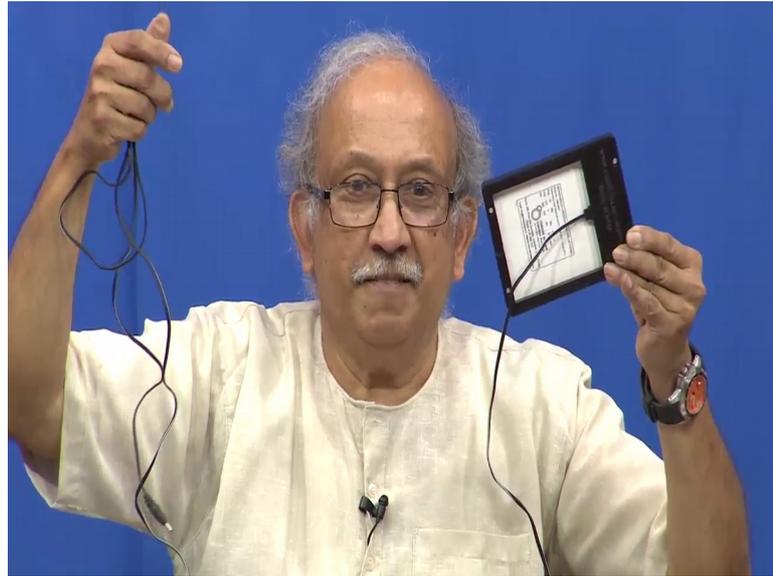
So, I have a solar panel here you seen this the solar panel I think it is not a big deal about it actually their cells connected properly in a series parallel combination and then finally, when they are connected in the end you have all of these jumbles of wires same this oh huge the amount of wires now, this is not a very good thing it makes sense only in one condition the only condition it makes sense is when the solar panel needs to be placed away from this where you need to use it and you need to charge it, And all this then also

we as we often find out the hard way the more you have the small what you call the shining pokey thing know.

Which we call a loosely called a jack they seem to be prone to lose connections and eventually where out is there way of integrating both of these. So, that it can be used in all environments. So, I was talking to yesterday saying that there was this initiative launched by somebody saying one child one light. So, somebody like you decided that if a child has his own personal light maybe is interest in going around and trying to learn things will be much better to start with this is a beautiful novelty. This novelty ensures that people take it easily and then you see several elements have been put on it saying first of all it stays neatly ok.

Most places it stays without any problem and then you have a handle we have a nice carry handle, and then there is a beautiful switch here you hold it you see here it is quite bright in fact, lights of the various things you set bright enough to light up a room right now because of this I will say limelight you cannot see the thing and then it has a long life LED lamp, the most important part of it is at the back of it is integrated with a small solar what you call a simple solar panel that is a solar battery having individual cells and there is the rechargeable lithium ion cell also is included in it in normal course even if water splashes on it is not likely to get damaged. Now we have beautiful a product here which combines several of the features the designer wanted to incorporate, this is not a matter of just taking a solar panel and then taking a solar panel buying an LED and sticking it up to that.

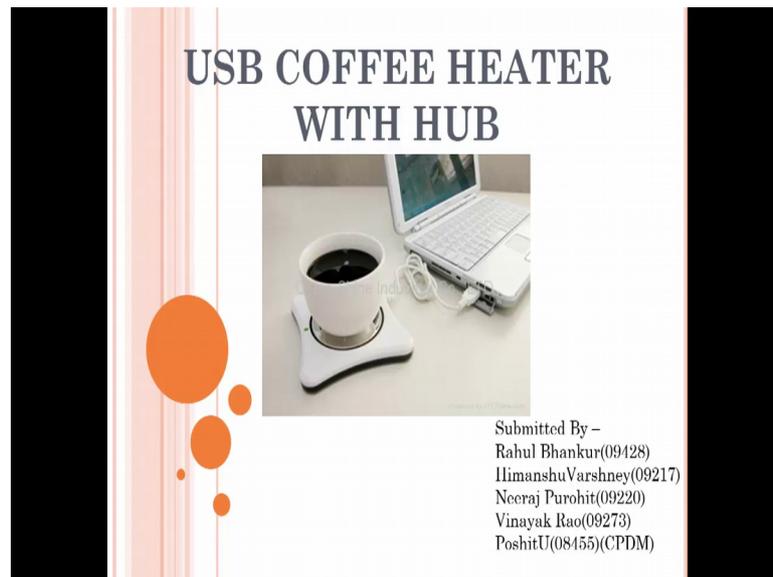
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It does not help it, is still no it is still a mess mess of these wires and at the back we have a serious problem with the solar panels if it has to be a place where it has to be charged end up with a long wire, it is a place which is close this wire is redundant now do you end up with adding extenders you had a small extended and so on it makes sense in some conditions which where I thought I will help you with this, if you have a look at this have a look at this you see here this one is very interesting carry along small novelty item.

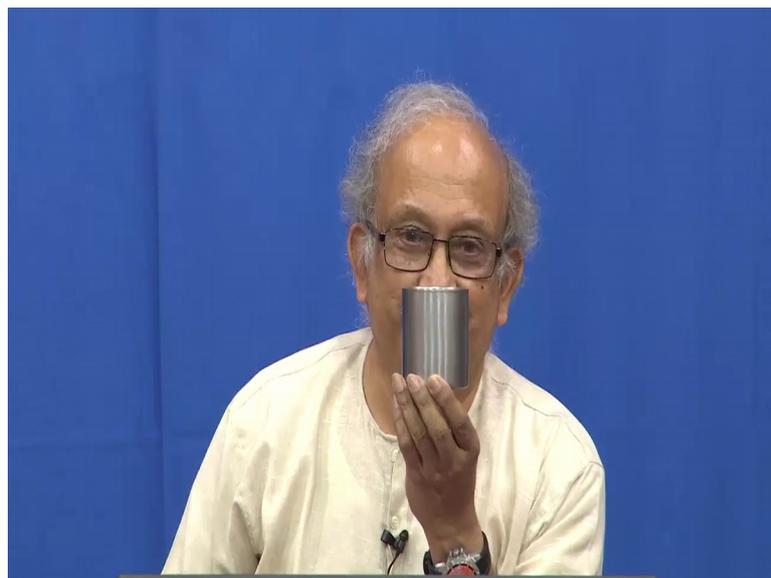
Then there is something which is a little like a switch here, it is actually a touch switch I can make it change color, I can make it brighter, I can make it softer you seen this all sorts of colors at their end it has a beautiful handle. In this condition probably the solar thing helps and it uses the same socket, but these days you see that USB ubiquitous USB mini and micro have come into things. So, it has that and then it has a beautiful curved handle. So, in the normal case you can probably care carried keep it around this too is still a rechargeable lamp except that it is a night lamp.

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Some of you have been in this field will probably recognize that Philips made one of the most beautiful lamps like this look it up and you know it gradually like brightens of your room and then it gives the noises which we like and so on. Now I will go back to other products which my students have made you seem to do what is called academic activity all the time, and you focus of the academic activity seems to be having coffee and tea.

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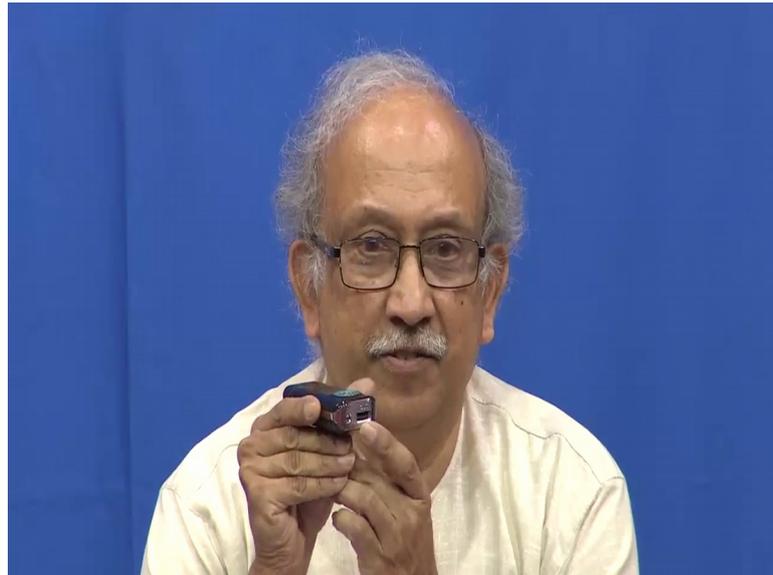


So, we have a tea cup due to some various reasons I had to detach the handle it had a handle once upon a time, and to detach the handle and we drink coffee all the time. In

fact, coffee with something coffee with you know best friend for life these are allegories and expressions or idioms.

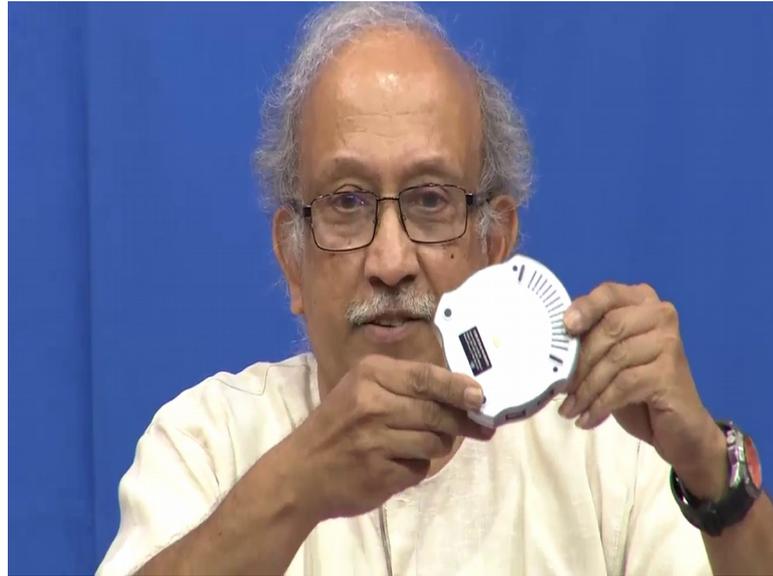
Which we use all the time is there a way of me to have hot tea or coffee that is the focus of it this was given to some students have taken this course.

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Then by proper analysis they have ended up with various options, one of the options is normally if you were to have a normal USB socket anywhere, USB socket like what you will find at the end of this, it is not capable of giving more than around 5 volts 500 milliamps they are also advised in fact, to keep it to about 350 milliamps. So, that in the unlikely case of some problem, the computer USB source will not get destroyed, now can we make boiled tea with it or teas steeped for a short time tea steeping is you put the tea in the bag in that involved it.

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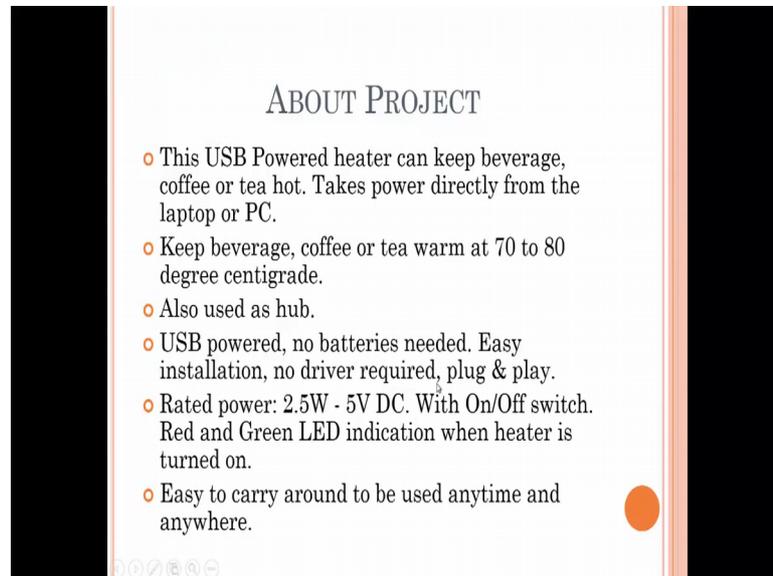
So, there are things already existing and nothing much about it you have it everywhere here just go to I do not know maybe Amazon or anything you have this beautiful objects, this has that USB things around and then it has a hot plate on top then there are also some indicators, and then you have these USB sockets all around, and something related to this is we have a switch and then there is also a separate source for supply for it. So, if you look at this object you will notice that various things they try to optimize in this I will show it back to here, various items they wanted you to optimize in this one of them is saying I make this top portion such that sits snugly with it.

So, if I were to get any hot beverage in the case of as use a tea or coffee or chocolate or I do not know what else people have, once it is hot you keep it on this and then probably add a cover also to this, then you can take a little longer than required it is not maybe it will last recession at least know 15 minutes you can use it world, if you have to make tea with it how can you have 5 volt supply maximum 400 milliamps that is you have two watts and even if you parallel it maximum can you get 4 watts, that possible for us to do something. So, that I start with cold water or water which is available in a hot water tap or faucet or kitchen sink where is a little normal inaudible little above ambient maybe around 50 degrees.

But for us to drink we need around 70 or 80, when this problem was posed your students are one of the students choice the problem he came out with this beautiful device saying

can we have a coffee maker with it has elements of all this it has a hum as a heater and all that.

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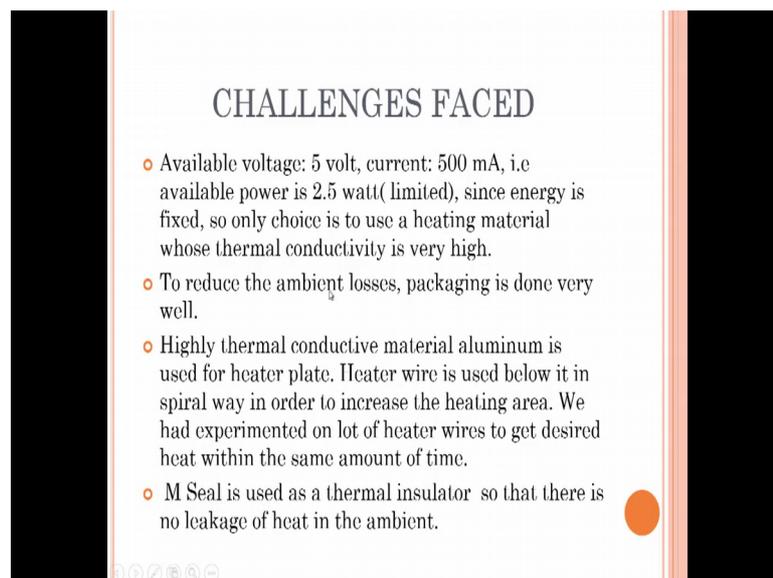
The slide is titled "ABOUT PROJECT" and contains a list of six bullet points. The slide has a white background with a thin orange border on the right side. There are black vertical bars on the left and right sides of the slide. At the bottom left, there are navigation icons. At the bottom right, there is a solid orange circle.

ABOUT PROJECT

- This USB Powered heater can keep beverage, coffee or tea hot. Takes power directly from the laptop or PC.
- Keep beverage, coffee or tea warm at 70 to 80 degree centigrade.
- Also used as hub.
- USB powered, no batteries needed. Easy installation, no driver required, plug & play.
- Rated power: 2.5W - 5V DC. With On/Off switch. Red and Green LED indication when heater is turned on.
- Easy to carry around to be used anytime and anywhere.

So, there 4 of them and then you notice here heater can keep beverage coffee or tea hot takes power directly, coffee or tea warm at 70 to 80 also used to the hub USB powered no batteries.

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The slide is titled "CHALLENGES FACED" and contains a list of three bullet points. The slide has a white background with a thin orange border on the right side. There are black vertical bars on the left and right sides of the slide. At the bottom left, there are navigation icons. At the bottom right, there is a solid orange circle.

CHALLENGES FACED

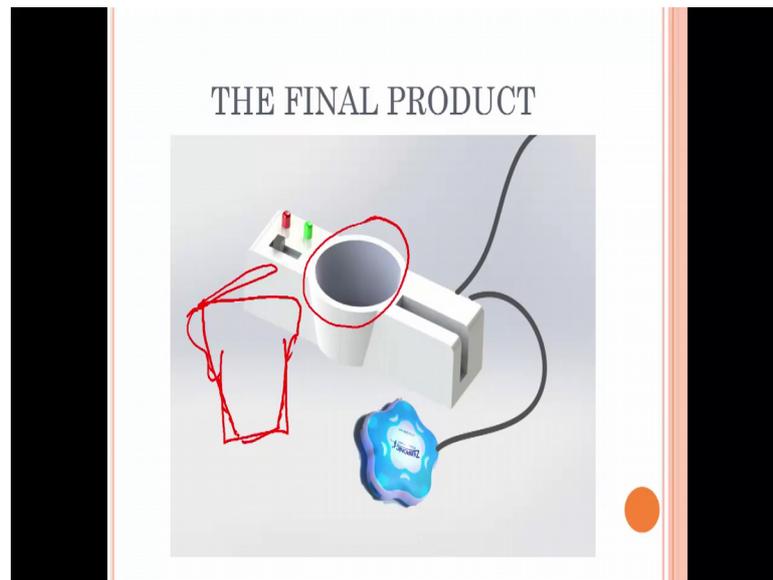
- Available voltage: 5 volt, current: 500 mA, i.e available power is 2.5 watt(limited), since energy is fixed, so only choice is to use a heating material whose thermal conductivity is very high.
- To reduce the ambient losses, packaging is done very well.
- Highly thermal conductive material aluminum is used for heater plate. Heater wire is used below it in spiral way in order to increase the heating area. We had experimented on lot of heater wires to get desired heat within the same amount of time.
- M Seal is used as a thermal insulator so that there is no leakage of heat in the ambient.

Rated power is only two and half watts limited since energy is fix only choice is to use from here one watts they have tried their best they have tried very very best one of the first thing is can we have a material which closely heats this all around.

If this were to be the cup if this were to be the cup is there something which will instead of just heating it only at the bottom something which does here. So, this other cup we check is come with it has a little problem one of the first problems is it sits then it is thin. So, it chances are it will loose what you call heat to the ambient same thing in this case is an insulated double walled stainless steel or maybe it is a combination of anything, this is a small seam here next time you have a look at it, but the only disadvantage is this is a flat surface and that one has a slightly dimpled surface for various practical reason. So, this sits well and it can conduct heat while this cannot conduct it because of the very peculiar nature of the dimple here.

So, a student set about saying what best we can do one of them is make sure that the heat goes well inside make something with at least. So, partly it will be able to do and then the external should be insulated they should be insulated and not insulated also meaning heat should go inside and it should not go outside there is such a thing possible maybe, if you have a what you call phase change liquid inside it will let you operate on the outside going condense inside, but in the normal condition since outside is warmer than inside, it will not directly transfer the heat. Now coming back to this high thermal conductive is used for the heater plate the base of heat base of heat is used with thermal highly thermal conductive same with this. Secondly, heater used to be light in a spiral way to increase the heating area.

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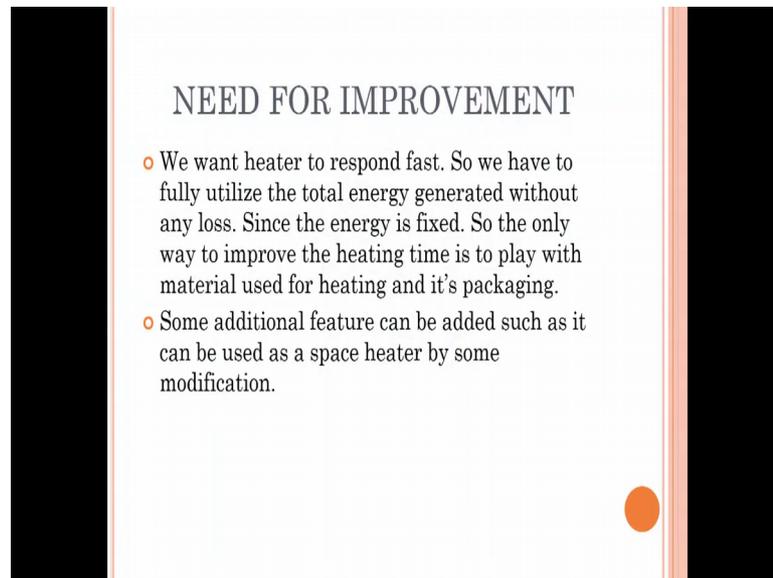


So, I have put a no leakage of heat to the ambient from the other things. They say the final product has few elements which I think you know we need to appreciate from the students point of view first thing you notice here this is no longer a cylindrical piece not a cylinder here. In fact, there is a taper this taper ensures that when you put something like one tumbler into a tumbler which loosely call a glass you know, a glass by definitions made of glass or steel container used for drinking water is probably a steel tumbler. So, if you put an aluminum tumbler into this normally it will try to get the maximum contact, and if the tumbler imagine of this is the tumbler we can probably have a grip little like this and then probably have a flip top cap on to this. Now having done this we have improved one of the first areas that is the contact with the heater has been improved dramatically.

Now, comes to the next important point saying when you have only around what you call two watts to dissipate up to heat how do you increase it. So, this is also comes with inbuilt battery now where we said it should be you just it you do not connect it to the computer immediately it should start heating, you just leve leave it connected to one of the USB things and then you build enough logic saying if the total some other device is drawing the power make sure that this is this gets switched off. So, we have a beautiful product here finally, where electricity is stored inside in a storage battery and the storage battery need not be here part of it because it is not expected to be portable, I would not mind having a small bigger storage battery maybe a 6 volts 4 or 5 ampere hour nickel.

I am sorry not nickel cadmium this is a let us it battery are now replacements are there, are we go for the ubiquitous now 18650 lithium ion cells. So, we have what was continuously 4 volts can.

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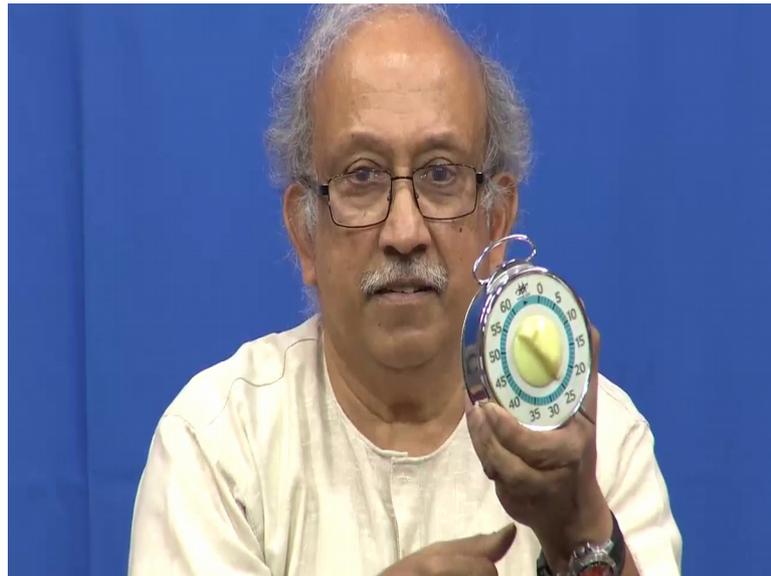
Now be stored the amount of energy, the rate of heating is not a critical issue anymore you just store the total amount of calories that are required and then after having done this the students have try to improve for it is packaging and then heating, additional features can be added such as a space heater by some modification having done this.

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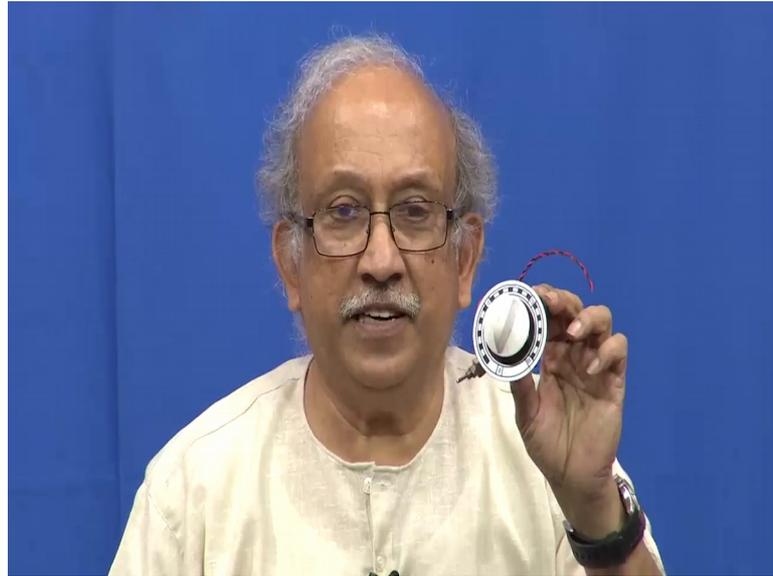
Now, I will go on to the next I will say objects which all of us needed for example, I one of those people who lose time if I am at a particular either expressing a thought or reading a book or gathering information, all the time I need not look at my watch like this. In fact, fortunately for me there is some people who enjoy listening to my voice other than myself.

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So, the thing is once I start practicing for an examination, this is our one of the students has not about this and then our original thing was saying why do not you carry a timer like this, while it looks nice is not it this is very jarring the moment the time is over at a jarring time it gives and then it really does not show me unless I look at it.

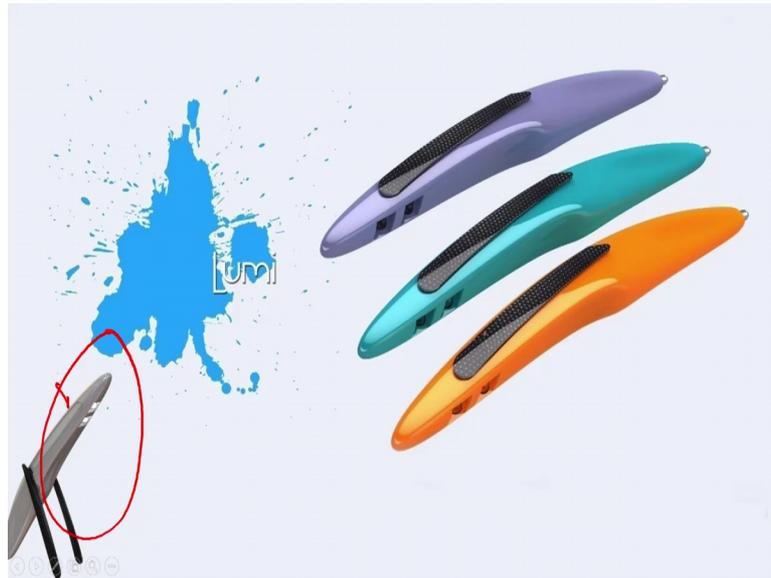
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And I cannot have what is called a lap time there is no lap time in these things these are simple mechanical timer. The next timer is usually you will find it on the front panels of old warmers heaters toasters where two things are there one is a switch which controls the power level another is this particular device which is again a mechanical timer yeah you can probably hear it in the feed same that in the feed you can hear the clicking.

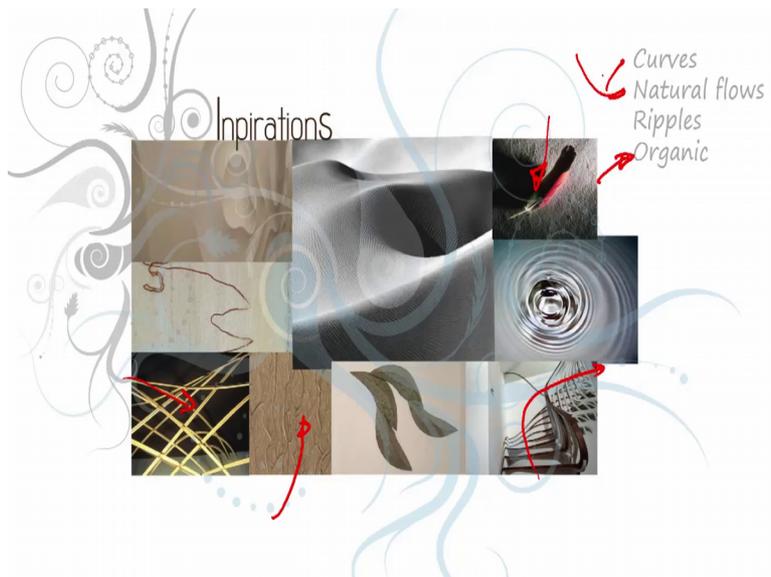
Now at the back we have all these various things and then I put a switch and then try to put it, but you see still say very unsightly device and main problem is I cannot hold the time and then at the end of the time I get a jarring note. So, this batch of students they decided to work on something which is very very useful for a student. So, now, if you look at my PPT slides even the word and the logo and the shape they have played a lot on it and ergonomic pen and pen stand with the timer the idea being as the slide the projector goes on.

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You seen the you seen the beautiful what I say the form it is handy really really handy and they have played tremendously with me logo and the whole positioning and you see how this is or anything and you see here small elements are here small black stuff there is something here there is something here, then it has a pointer, then it has a what you call some switches and then you see the form it has a very good ergonomic or something which fits your hand very well.

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So, they want about trying to understand can we take use from nature, yes nature is not a geometric thing like what we think that was straight lines in nature even in the matter of perspective because of your finite you call angle of view, you end up with vanishing lines everywhere wherever you look to the (Refer Time: 23:08) lines will go and vanish to one point.

So, strictly speaking the parallelism is not maintained similarly any object you see here of course, this is a special somebody has placed down in a stairway, it is a stairway and then you have various things here and then you have a most important here is something which is a quill and then some of you may remember we have all these bamboo and reed furniture then you have surfaces here, then you see all this beautiful this spirals even this spirals in nature are supposed to be following the so called fibonacci or fibonacci series. So, the issue is it is all organic and flows are always natural and covered.

So, they played on it and come out came out with this nice thing. So, we have an actual pointer here which is the pen, it could be a ball pen a ballpoint pen like a bicker or it could be a just a pointer which you can have and finally,

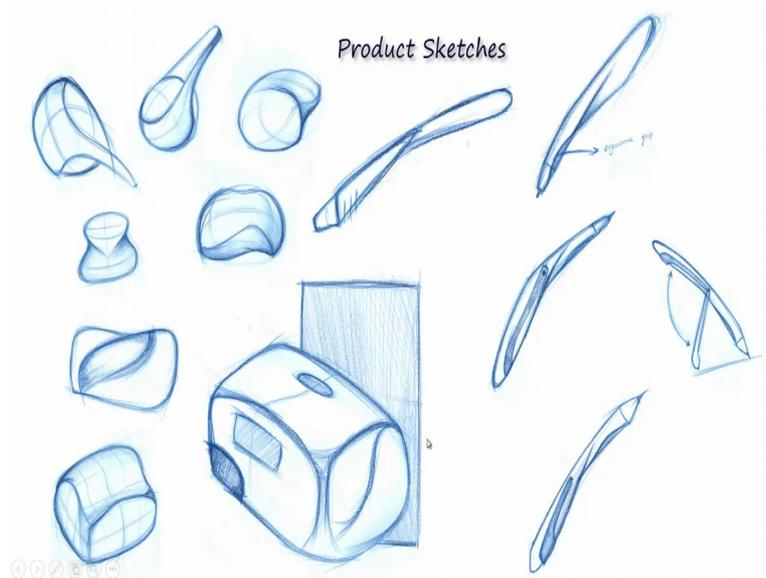
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This is the object that has been made I will leave a little time for you just read it yourself, read this left part and then read the right I will read it in my own thing. I hope you have finished reading it one of the features which would have missed it the first point is that you have two LEDs here.

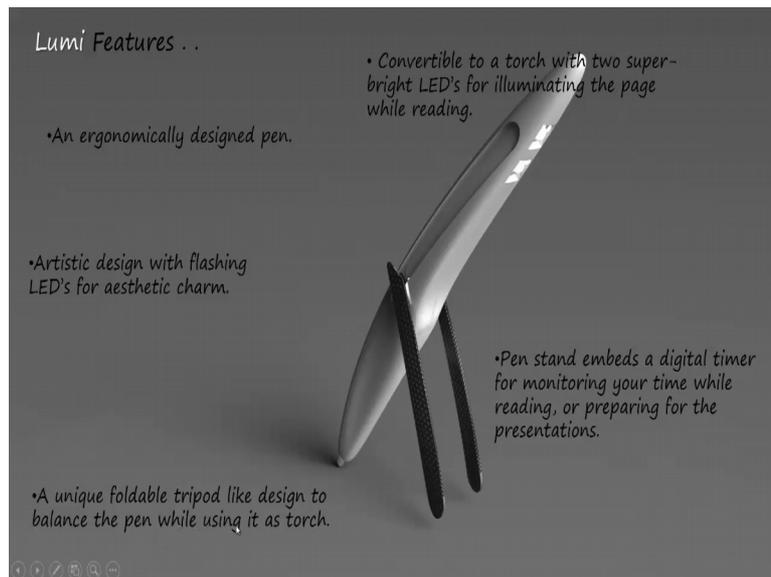
If you go back again in the slideshow you see here it is standing on a stand and the stand is integral with it you see these two black things probably there is a small depression here, and then they go back and sit here there is a provision for the thing to sit there and then it light up your table and then even if you see the name lumi. Lumi has two parts of it one is saying it luminesces another is it enlightens you it is a eventually you will become a luminaire whole things has been played on it and then aesthetic and then you see several series of buttons and there is a timer and all that.

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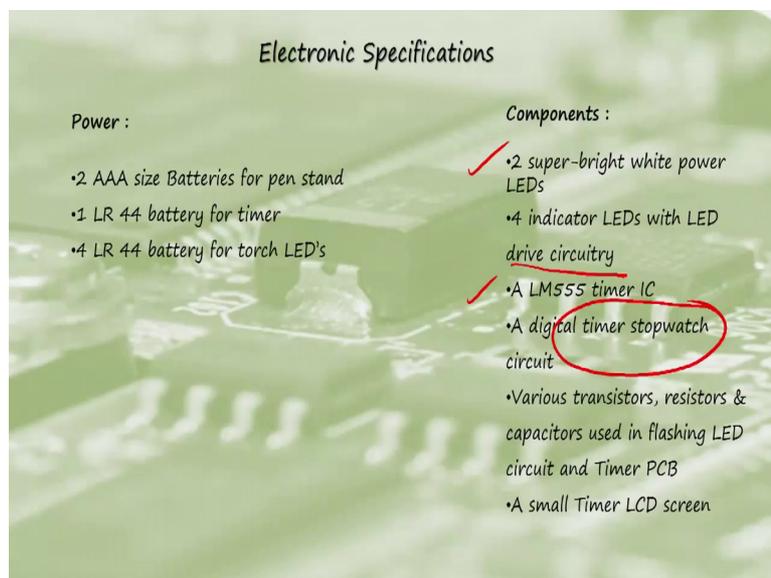
So, probably in the succeeding slides they have explained what would be the think this is where why I included details in this particular lecture you need to practice your skills it is tough these are of course, made by product design students I know already they have been they enjoy this and then they have been brought here and then they were one of a group of 4 or 5 people. So, one of them concentrated on the form development, you see here not tremendous amount of form right side these views these are all about the writing instruments including other option for it these are all about the base unit how should the base unit look, and then what should the base unit have getting better.

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I will go to the feature somehow a unique foldable tripod like design to balance the pen, artistic design with flashing LEDs and the top an ergonomically designed pen.

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And it does not read well convertible from a bright LEDs while reading pen stand embeds a digital timer for monitoring your time while reading or prepare for presentations, which I feel the very very critical issue about it electronics is here. So, there we again a few more details one of them is we have LEDs then important is this driver circuitry then there is a timer, and then there is a stopwatch switch, the stopwatch

circuit helps you in pacing your work this case when you want to pass exams which is real you know it to be fast, it probably given enough time I took in I mean solve problems.

But within the allotted time of around 60 to let us say maximum 180 seconds I have to quickly select what is likely to be a better answer. So, we do not have much time. So, this particular thing also has a stopwatch circuit meaning it will give you a lap type of time. Saying you can use a lap time or you can have cumulative time and then there are various the stuff to use and then you have a small screen here which will show you the time then they are given the power supply and then there is a small battery for the actual stand, and then you have the timer itself needs something to keep track of the time it should not reset it here.