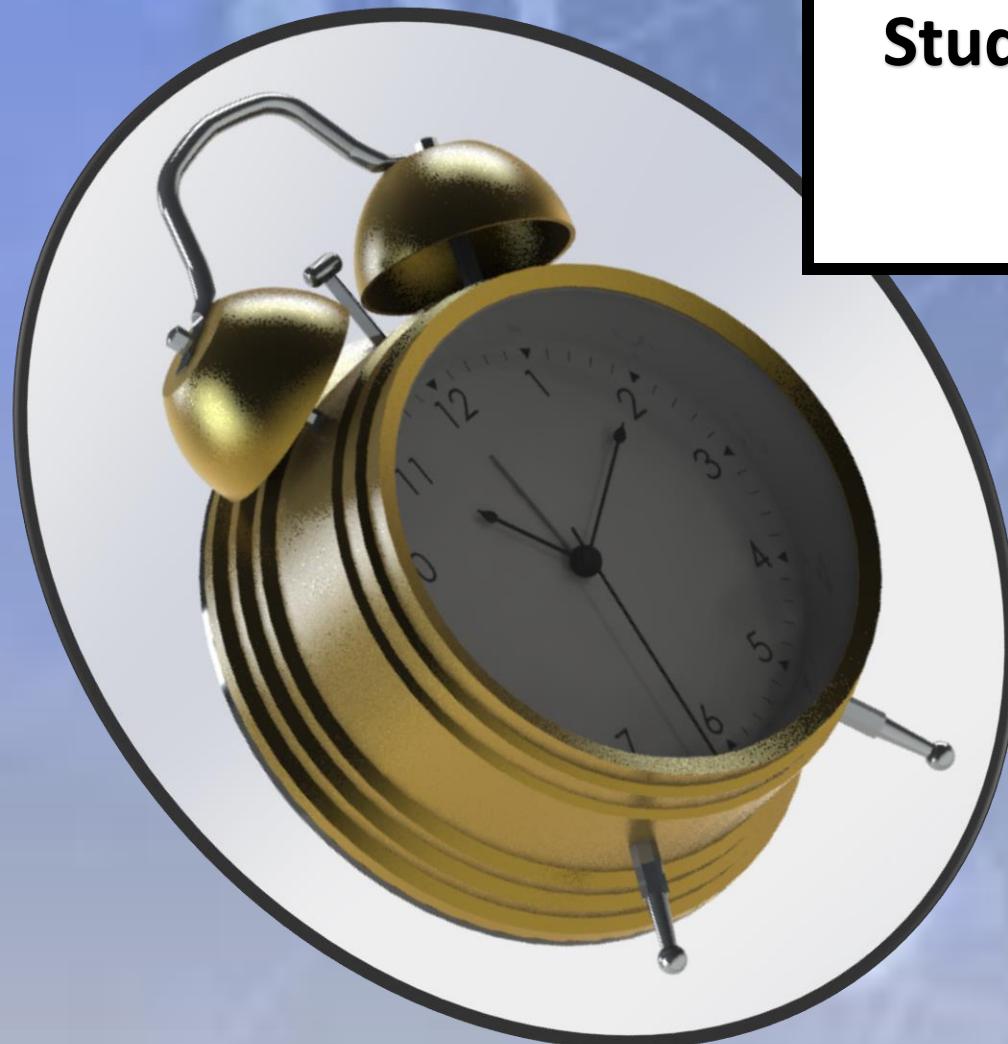
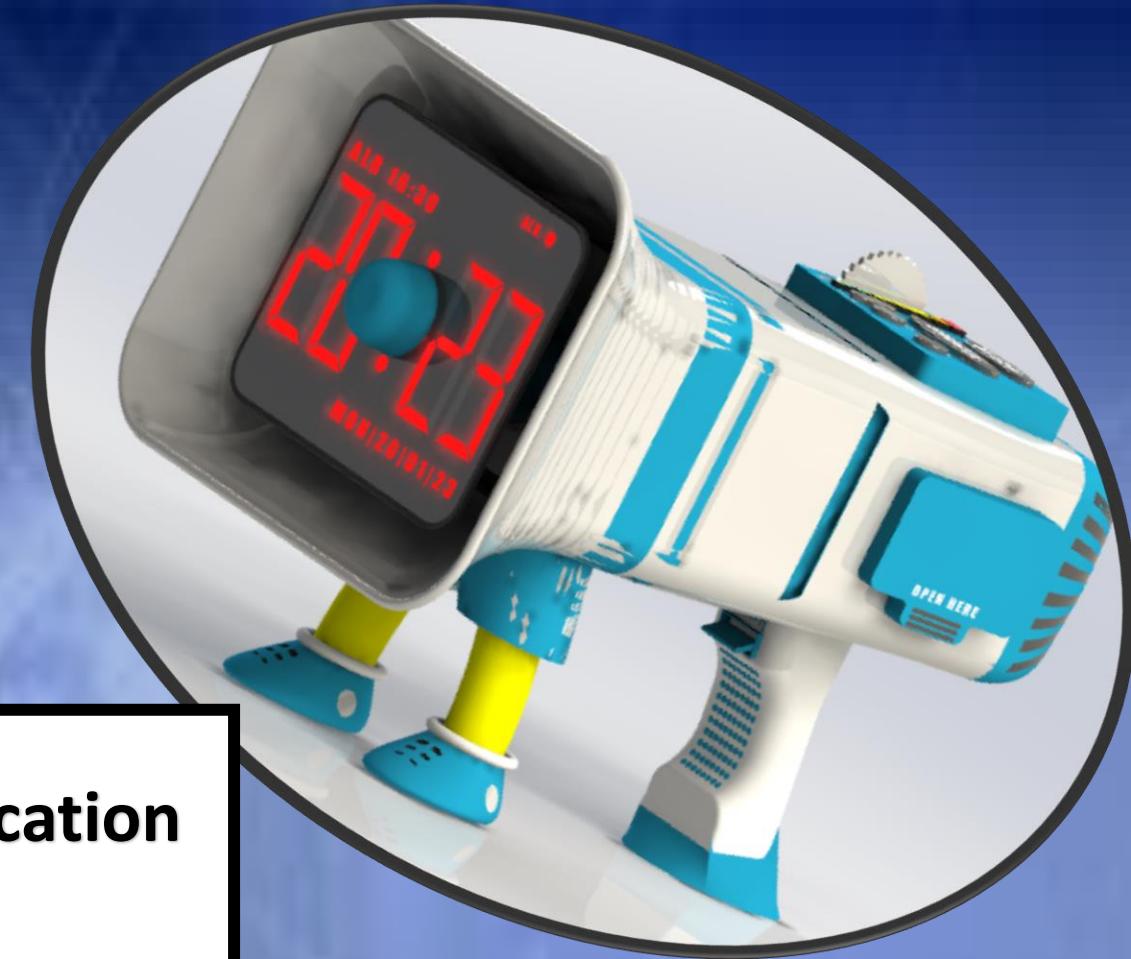


Exam Number: 154709

**Design and Communication
Graphics
Student Assignment 2023:
Alarm Clocks**

Exam Number: 154709

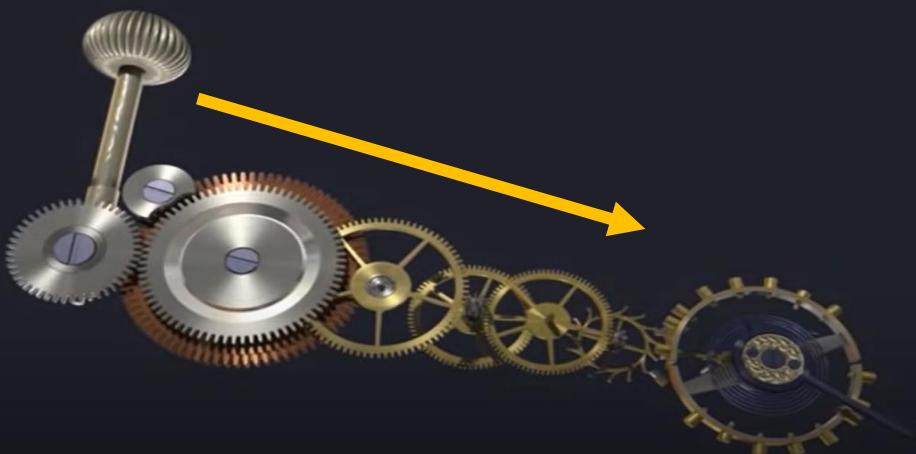


OUTPUT 1 | TIMELINE

Exam Number: 154709

Bedside alarm clocks are primarily designed to wake people from their sleep at a particular time. They come in analogue, digital and more recently in smart form. Their shape and form is underpinned by a wide variety of geometry and they are available in a range of materials and colours. Some alarm clocks can be turned off in innovative ways. Design features of a bedside alarm clock may include time display, snooze buttons, programmable alarm options, Bluetooth, etc.

My initial impression was formed by an image of a digital alarm clock, that appears in the shape of a megaphone as it is a provider of sound and could match the aesthetics of a digital alarm clock. An alarm clock which has an modern resemblance; is inexpensive and targeting the newer generations by the looks and the playful aspect associated with it along with some relation to cartoon characters to elevate the design to give the user a pleasant, cheerful sight in the morning to start off the day.



5 FUNCTION COMPONENTS IN AN ALARM CLOCK

1) TIME WIND-UP

The power of the whole timing mechanism comes from the mainspring. The power is obtained by turning the T-shape handle, which will connect to the mainspring gear, then deliver motion to the mainspring. For this to happen, correct mating between handle and gear is required. If the gear is placed incorrectly, the spring will not move and store power.

2) TIME INDICATING

Power from the mainspring is received by adjust gear and delivered to each hands gears. The wheel is connected to a Swiss lever which is also directly connected to a gear that the second hand is mounted on. The Swiss lever acts like pendulum swinging back and forth, allowing gears to rotate one tooth at a time. The sound "tick-tock" of a mechanical clock rightly comes from the movement of this Swiss lever. Ratio from 'second' hand gear to 'hour' hand gear is 720:12:1.

3) TIME SETTING

Time setting is achieved by turning the round shape handle to move the adjust gear, which will drive motion to minute and hour hands gear, thus change position of the hands.

4) ALARM WIND-UP

The power of alarm spring is obtained by turning alarm wind-up T-shape handle, this'll deliver motion to the mainspring so that they store potential energy -> kinematic energy. Escapements are used here to control the unwinding speed of the mainsprings, preventing them from releasing the potential energy too fast.

5) ALARM SETTING & RINGING

When that time comes, a cantilever is pushed down making it no longer constrain the movement of the alarm bell striker. With the quick unwinding of the mainspring, the striker is pushed back and forth via a reverse Swiss lever, vibrating a pair of bells to produce the alarm noise.



2005 | SLEEP STAGE MONITORING

Alarm clocks involving sleep stage monitoring appeared on the market in 2005. The alarm clocks use sensing technologies such as EEG electrodes and accelerometers to wake people from sleep. Dawn simulators are another technology to mediate these effects. As well as showing weather forecasting.

PRESENT

Like most things around us, alarm clocks have come a long way. The present scenario is not unknown to us. With the advent of digital era, alarm clocks have found their way into our digital devices in the form of apps and web-based tools. More often than not, people now wake up to their phone's alarm tone.



1956 - 1970 | D.E. PROTZMANN

The earliest digital alarm clock came in 1956 with the snooze button. In 1970, they patented another one with less moving parts. Two side-plates held digital numerals between them, while an electric motor and cam gear outside controlled movement.

1945 | JAMES REYNOLDS

Reynolds invented the first radio alarm clock. People could now choose to wake up to the morning broadcast of news or soothing music rather than the blaring sound of the alarm. This is considered a huge milestone in the alarm clocks' industry.



1847 | ANTONIE REDIER

Redier was the first to patent an alarm clock that was adjustable. This adjustable alarm clock came with a dial which has a hole for each number. The user just had to insert a pin into the hole of the hour they needed to wake up at. Note that this clock was only adjusted in terms of whole hours.



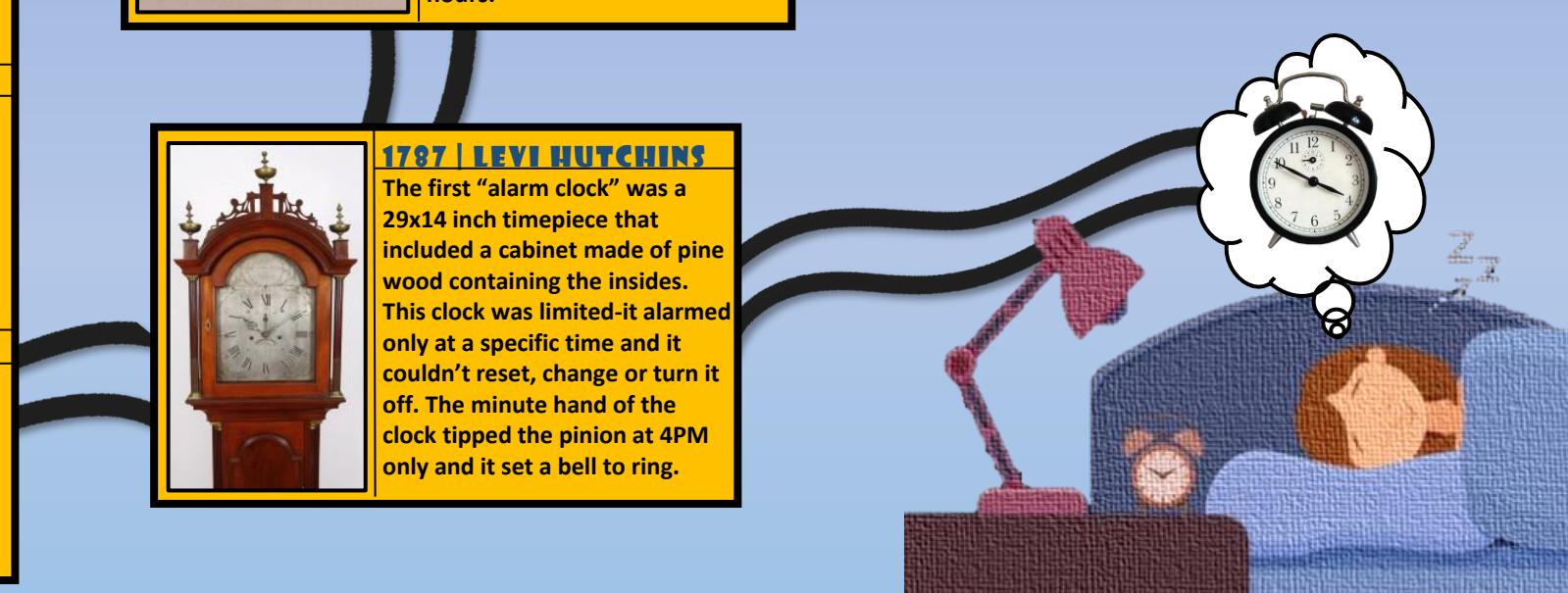
1876 | SETH THOMAS

Thomas patented his own version of mechanical wind-up alarm clock that could be set for any time. His company mass produced such alarm clocks. Thus began the dawn of modern-day alarm clocks which was easily accessible to the ordinary people. This clock's dimensions were: (10x8.3x4.9)inches



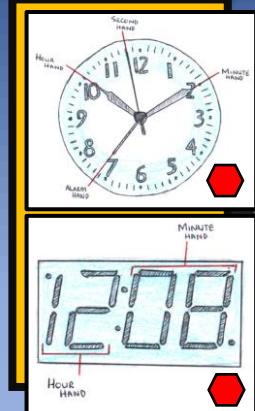
1787 | LEVI HUTCHINS

The first "alarm clock" was a 29x14 inch timepiece that included a cabinet made of pine wood containing the insides. This clock was limited-it alarmed only at a specific time and it couldn't reset, change or turn it off. The minute hand of the clock tipped the pinion at 4PM only and it set a bell to ring.



OUTPUT 1 | DESIGN RESEARCH

Exam Number: 154709



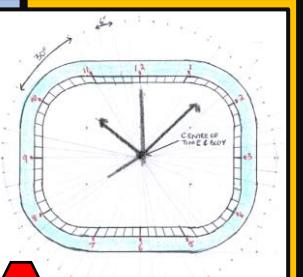
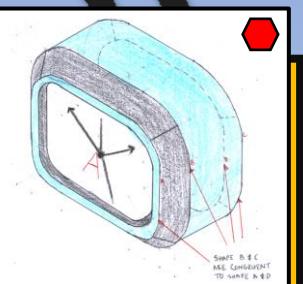
TIME DISPLAY

Time representation comes in two forms: analogue and digital. Analogue time could be told using the hour hand(short thick hand), minute hand(long thick hand) and the second hand(long thin hand) to convey time. The time for the alarm can be set by rotating the alarm hand(short thin hand). On the other hand, a digital alarm clock uses mere digits to convey time both in a 24-hour and 12-hour manner while analogue clocks only tell time in 12-hour manner. Most recently, time now could be told electronically on smart phones/tablets and on webpages/software on a computer.



GEOMETRY

Alarm clocks are designed mainly on geometry. Minority of them involves a polygonal based structure with larger congruency, then back to normal congruency as shown in the diagram. Majority of builds incorporates a symmetrical irregular structure that has curves to include the twin bells on top of it. It is worth noting that all points on a face have a similar distance from it and the centre to increase stability. The time display on an analogue alarm clock is based on a congruent shape relative to the elevation's shape. On the time face, the hours are separated into 12 sectors from 360° by 30° , the minutes and seconds are separated into 60 sectors by 6° , all of which are converging to join in the centre of the alarm clock. The time face must have enough space for the hands to rotate around.



MATERIALS

WOOD

As rare as it is now, wooden clocks was the first to step into the light. A normal wooden alarm clock costs between €20-€50 merely for homely effects it brings in the room and is much more fitting in a house. However, this is not ideal for ordinary people as wooden alarm clocks are dear. Although, a wooden alarm can withstand several decades, it is vulnerable to permanent damages and stains. Wooden alarm clocks generally appear in digital formats as a wooden twin bell alarm clock is not effective for the alarm sounds, so they come in with built-in alarm sounds.

PLASTIC & METAL

The production of alarm clocks are now heavily based on plastics such as polycarbonate. Plastic alarm clocks' price ranges from €10-€25 while polycarbonate alarm clocks' price ranges from €20-€35 due to it being more durable, lighter, thinner and stronger. Plastic can be transformed into any design while still being relatively cheap and attracts the young generation through its modern looks and playful design. Metal such as brass is now popular for the case, and the internal and external components due its resistance in corrosion and increased durability to withstand several decades.



PHYSICAL FORMS AND SHAPES

Alarm clocks should be portable and physically appealing. To achieve this, manufacturers produce them in extruded shapes of square, trapezium, circle, hexagon, rectangle or even in irregular shapes such as heart. To enhance the durability of an alarm clock, the stress is reduced from the corners by filleting them as well as the edges to protect it from experiencing too much damage from a fall. This is due to pressure decreasing as area of impact increases. Alarm clocks should not be easily tipped over. In terms of space and portability, users looks for relatively small filleted cubic alarm clock like boxes. However, for the iconic visually pleasing aura, people tend to use the twin bell alarm clock extended from circles or alarm clocks with unique designs targeting a specific age group or for interior designs.



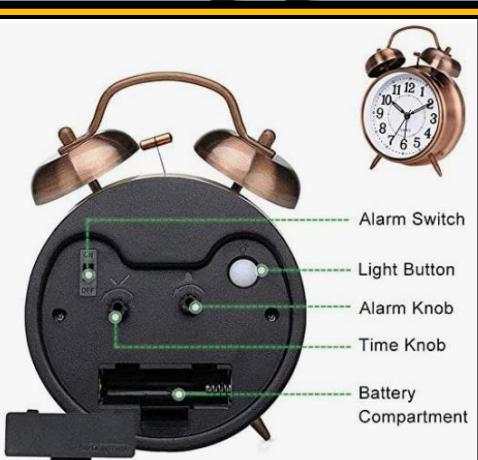
INNOVATION AND FEATURES

Features is what sells an alarm clock to match users' tastes and likes. This usually arrives with a digital alarm clock and these features are accessible through buttons. People who wish to listen to radio as their alarm buys a radio alarm clock. Alter between soothing alarm sounds from a melodious music to nature's pleasant sound effects. You can insert your TF/SD cards to play music of your own. Accessing alarm on/off settings or adjusting features like snooze, brightness and alarm volume. Recently, USB ports is added to charge the alarm clock or even connect to your laptop/computer and use its battery as the power source. Should be able to set multiple alarms and a backup battery option. You can use the clock's built-in speakers to make hands-free calls or listen to your favourite news broadcasts through Bluetooth. Analogue alarm clocks can only hold one alarm and one alarm sound. It does have a 'night light' feature to light the time face in the dark.



ERGONOMICS

Ergonomics deals with the comfortability and how a user interacts with the alarm clock. For example, for a double bell alarm clock's legs should be directed towards the centre of the time face of the alarm clock as well as a bigger back shells to ensure the time face is visible at all positions particularly at sleeping positions. To prevent it from being easily tipped over, the mass is distributed more on the front side to counteract the mass at the back. Labels should be clear towards the function at which it is pointing towards to avoid confusion. The knob must have sufficient space around it to enable the adjusting of it. It also should have teeth-based coating around it to increase the grip on the knob. In case the alarm clock has tipped over, the 'night light' button must not turn on unless severe pressure is built on it. This is to save the energy from the battery.



OUTPUT 1 | COMPARE & CONTRAST

Exam Number: 154709

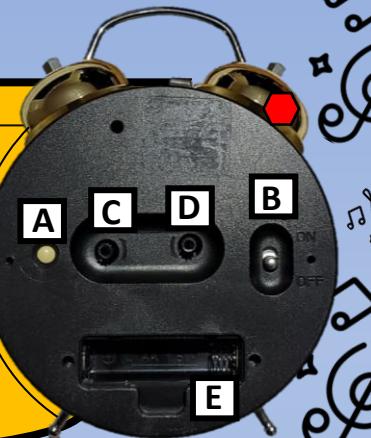
130mm



ANALOGUE TWIN BELL ALARM CLOCK

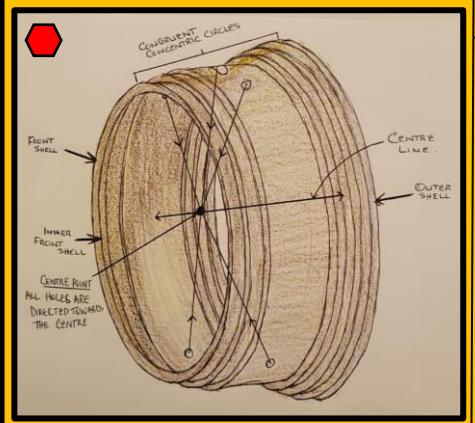
PHYSICAL FORMS AND SHAPES

A twin bell alarm clock appears in a cylindrical form to suit the circular time face, slanted twin bells and the hands for an analogue alarm clock. The filleted edges creates a soothing effect on touch, including the sphere-like bells. The outward projection of the 50mm circle from the glass front cover ensures that when tipped over on its front, the front cover remains undamaged on impact unlike the digital alarm clocks. Forms like these adds to the user-friendliness as the adjustable features are simply placed on its back.



INNOVATION AND FEATURES

A typical twin bell alarm clock has a "night light" [A] to see the time at dark, "on/off" [B] option for alarm, the adjustability of the knobs of hands [C] and the alarm hand [D] which activates at the position of the hour hand and a battery compartment [E] to provide power for the alarm clock. These types of analogue alarm clocks strictly comes with the basic features and no add-ons are associated with them. Thus, making it limited to only one alarm to be set at a time while digital alarm clocks offer a variety of features such as a radio and a dual alarm due to the mechanism and functionality associated with it.



GEOMETRY

For this twin bell alarm clock, the case is precisely designed to suit all the components external to the case. The 'front shell' is designed as a shield to the transparent material if it were to fall forwards. All the shells are congruent to one another and is formed from the centre line. On front elevation, it appears as concentric circles. The holes created for the bell pillars and legs are directed towards the centre line. The shells at the back provides stability as well as a sloped view of the time face. The holes are inline through the centre line with the opposite hole for extra stability.



MATERIALS

This alarm clock has a plastic case, plastic front cover, brass bells to emit loud sounds, metal components like 'bell connecting rod', 'bell pillars', 'bell striker', 'legs' and a plastic back plate. Brass is used for its great resistance to corrosion that requires very low friction with connectors and connecting parts. Plastic is used for its superior design flexibility and varied colour tones it offers.

DIGITAL RADIO ALARM CLOCK

SHAPES AND PHYSICAL FORMS

This digital radio alarm clock is based on a trapezoidal prism in which its height is approximately equal to the width of the alarm clock. The box-like form makes it portable and stable which prevents the risk of it being tipped over. To accommodate the features of a radio alarm clock such as the buttons and the speakers, the top surface must have a large flat surface area. As every model of a digital alarm clock, the time display is slanted to avoid the straining of the users as well as filleted edges to increase comfortability on finger indents which also enhances the quality of the overall alarm clock making it visually appealing.



FEATURES AND INNOVATION

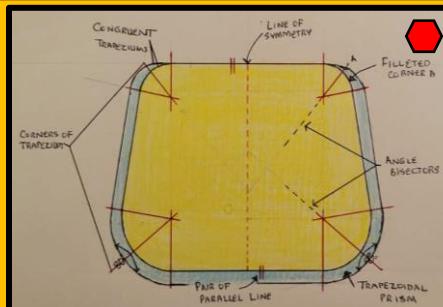
A standard digital alarm clock consists a LED display which is powered by electricity. Press 'POWER' to turn the radio on. The default FM radio frequency is 87.5 MHz. Press 'BAND' once to enter the AM radio mode which is at 522KHz. Repeatedly press 'MIN/HR' for the desired station. Adjust the volume by pressing 'AL2/AL1'. Press and hold 'SET' to store the station. To listen to preset radio stations, repeatedly press 'MEM' to select the desired radio station. Most digital alarm clocks carry a snooze button and a dual alarm option as well as a 'DIMMER' to adjust the brightness. It is clear that a digital alarm clock serves a better experience in living with an alarm clock and the box-like form makes it easy to hold these features.

Specifications

AM: 522-1620 KHz
FM: 87.5-108 MHz
Power source: AC 230V-240V ~50Hz, 5 W
Power consumption (clock only) : <1W

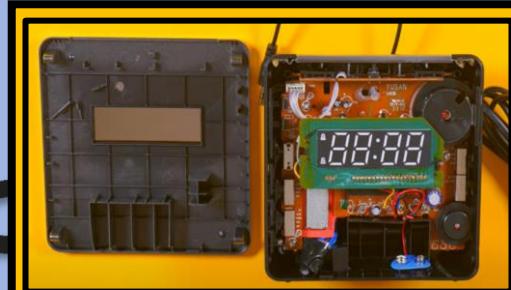
GEOMETRY

Dissimilar to the twin bell alarm clock, there is no layer protecting the transparent material. As shown, the shape has one set of parallel lines and two unlike lines which makes it a trapezium with a larger congruent trapezium beneath it. The corners of the trapezium are filleted using circles that lies along the angle bisectors. This prism is symmetrical just like a twin bell alarm clock for stability of the overall design.



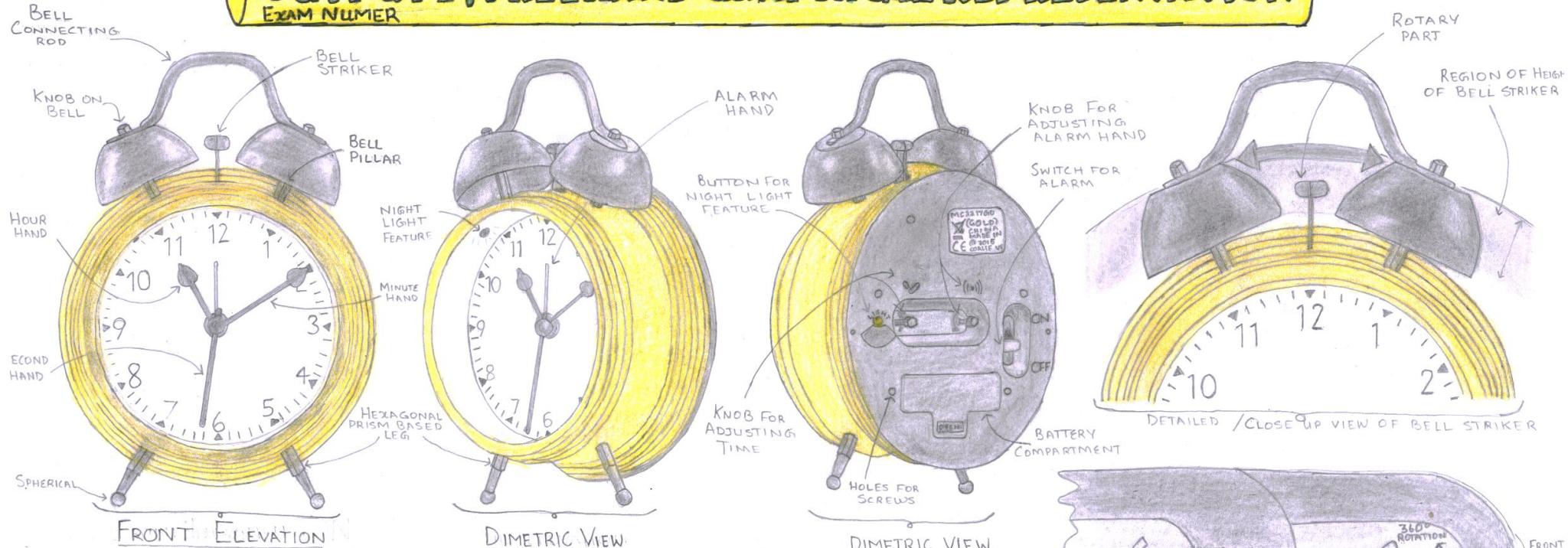
MATERIALS

The outer body or the case of every digital alarm clock is made out of plastic as to not conduct electricity and shock the user who is using it. However, the internal components are made of copper and steel to conduct electricity through it. The back plate is made out of plastic as it's an insulator for safety.



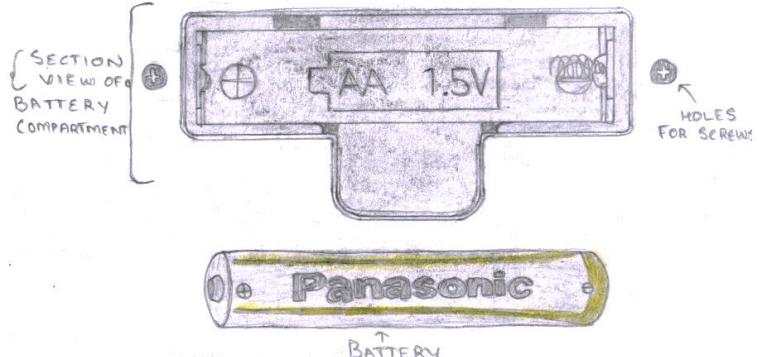
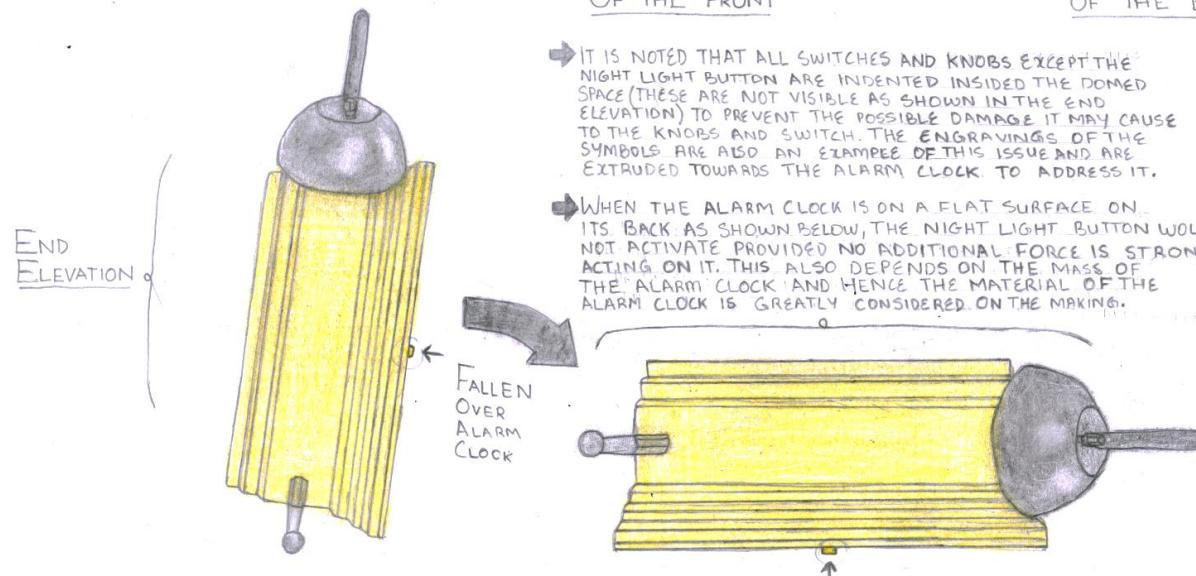
OUTPUT 2 | FREEHAND GRAPHICAL REPRESENTATION

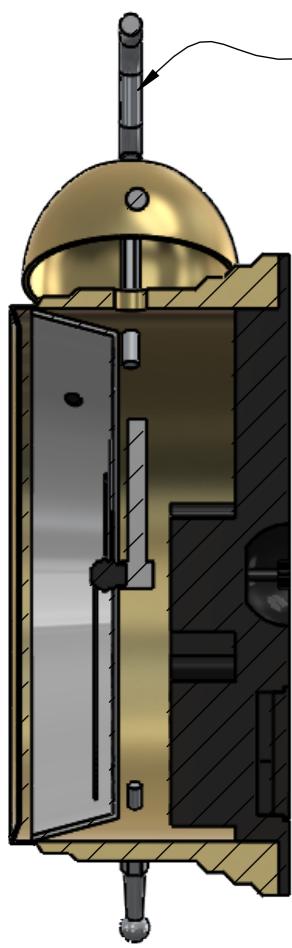
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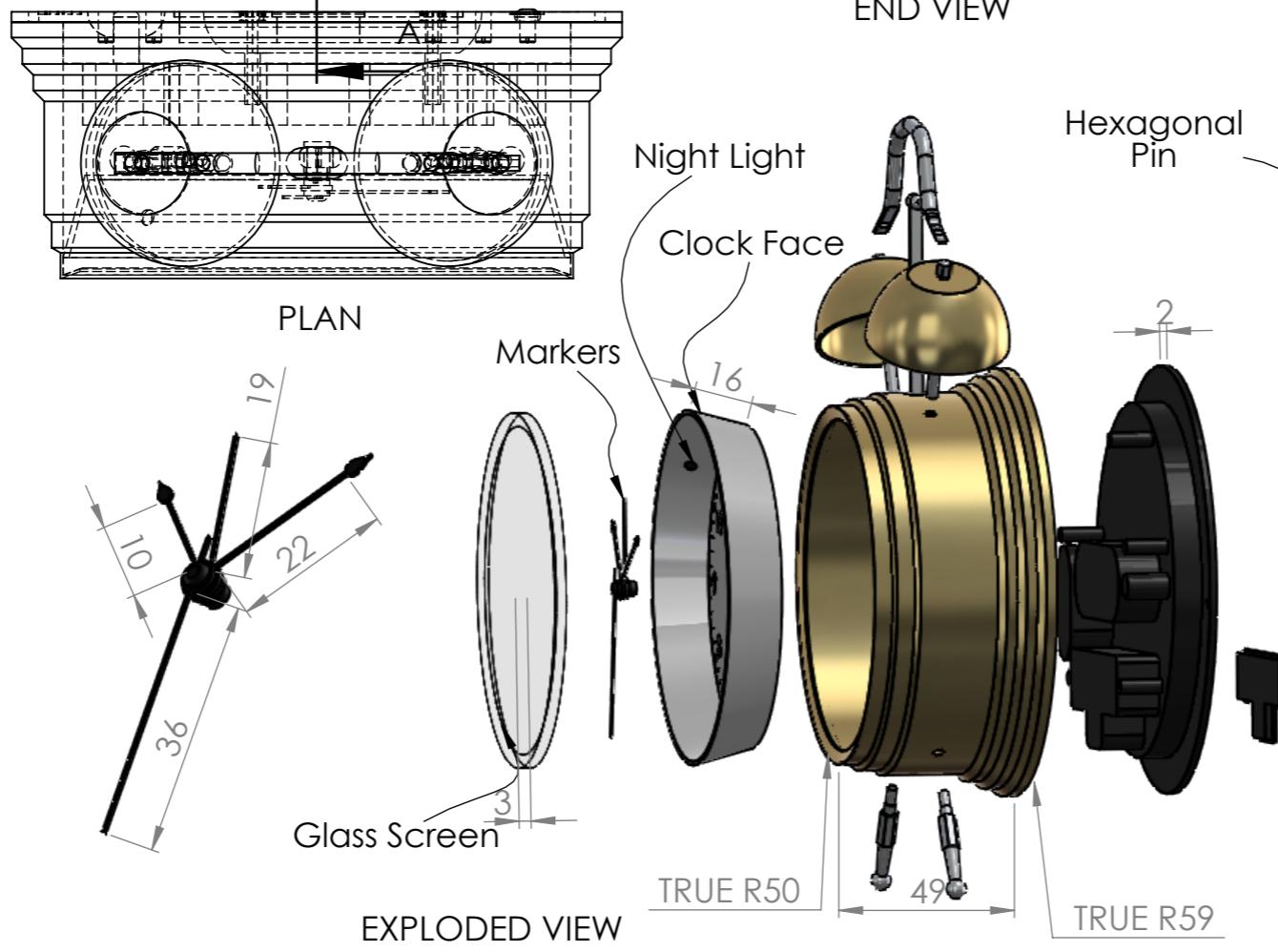
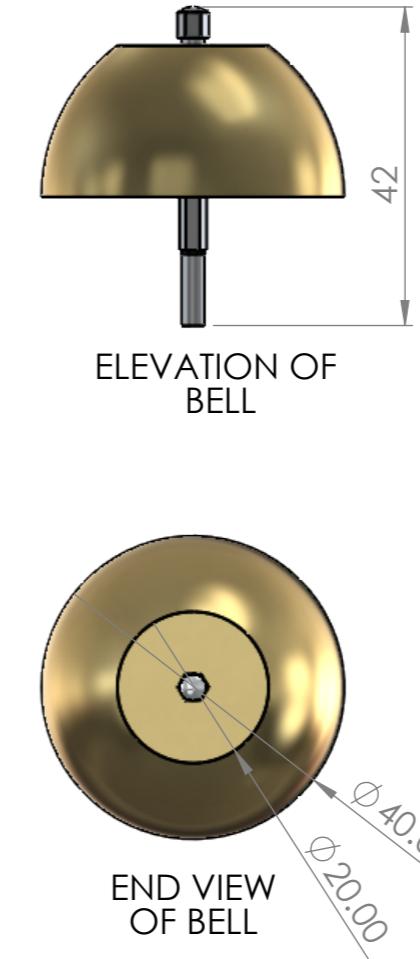
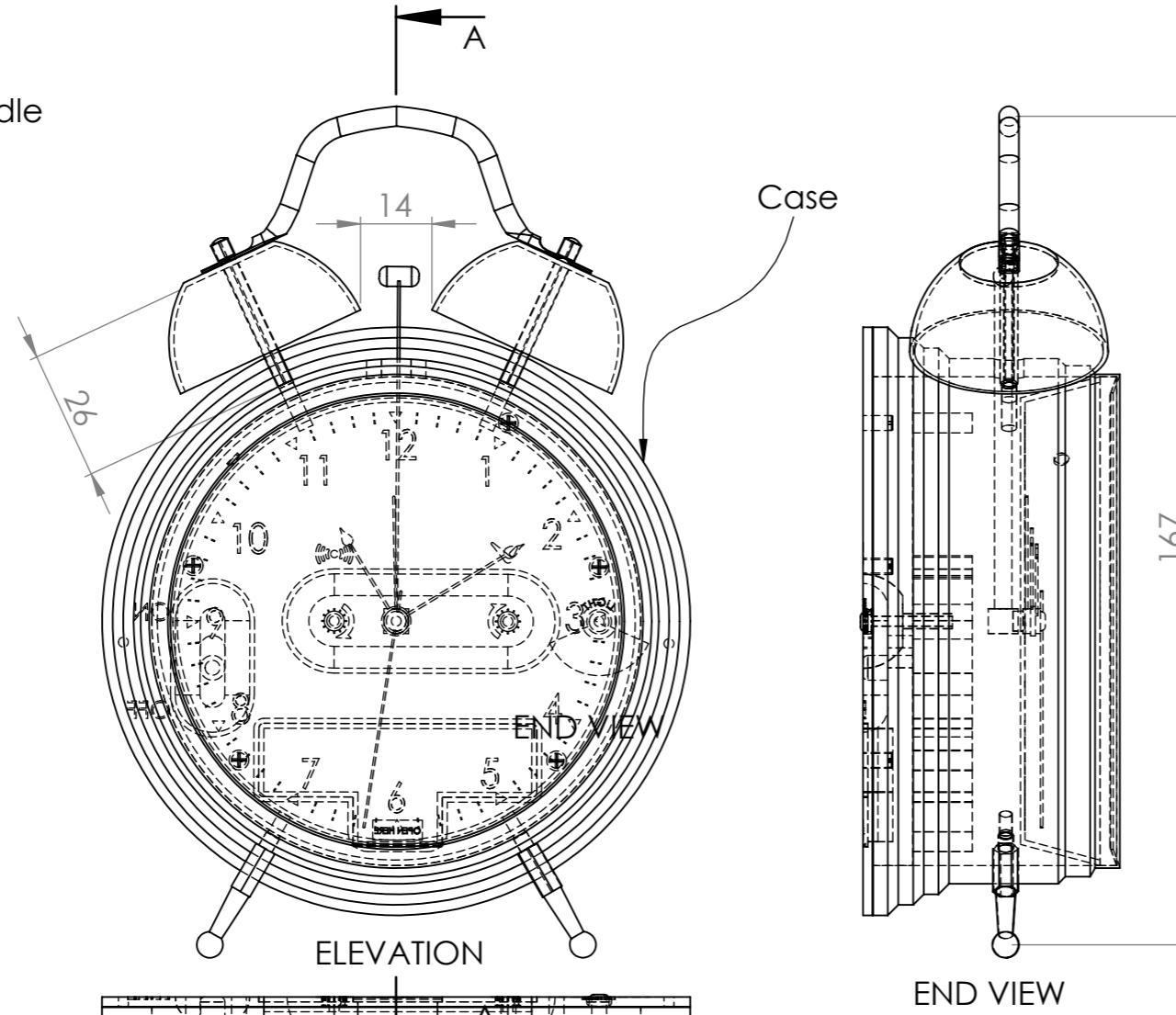
→ IT IS NOTED THAT ALL SWITCHES AND KNOBS EXCEPT THE NIGHT LIGHT BUTTON ARE INDENTED INSIDE THE DOMED SPACE (THESE ARE NOT VISIBLE AS SHOWN IN THE END ELEVATION) TO PREVENT THE POSSIBLE DAMAGE IT MAY CAUSE TO THE KNOBS AND SWITCH. THE ENGRAVINGS OF THE SYMBOLS ARE ALSO AN EXAMPLE OF THIS ISSUE AND ARE EXTRUDED TOWARDS THE ALARM CLOCK TO ADDRESS IT.

→ WHEN THE ALARM CLOCK IS ON A FLAT SURFACE ON ITS BACK AS SHOWN BELOW, THE NIGHT LIGHT BUTTON WOULD NOT ACTIVATE PROVIDED NO ADDITIONAL FORCE IS STRONGLY ACTING ON IT. THIS ALSO DEPENDS ON THE MASS OF THE ALARM CLOCK AND HENCE THE MATERIAL OF THE ALARM CLOCK IS GREATLY CONSIDERED ON THE MAKING.





SECTION A-A
SCALE 1:1.4



ITEM NO.	PART NUMBER	QTY.
1	Case	1
2	Hexagonal Pin	2
3	Glass	1
4	legs	2
5	Clock Face	1
6	markers	1
7	Backpiece	1
8	Back Attachment	1
9	Bell Striker	1
10	Handle	1

NOTES:

UNLESS OTHERWISE
SPECIFIED
DIMENSIONS ARE IN
MILLIMETERS

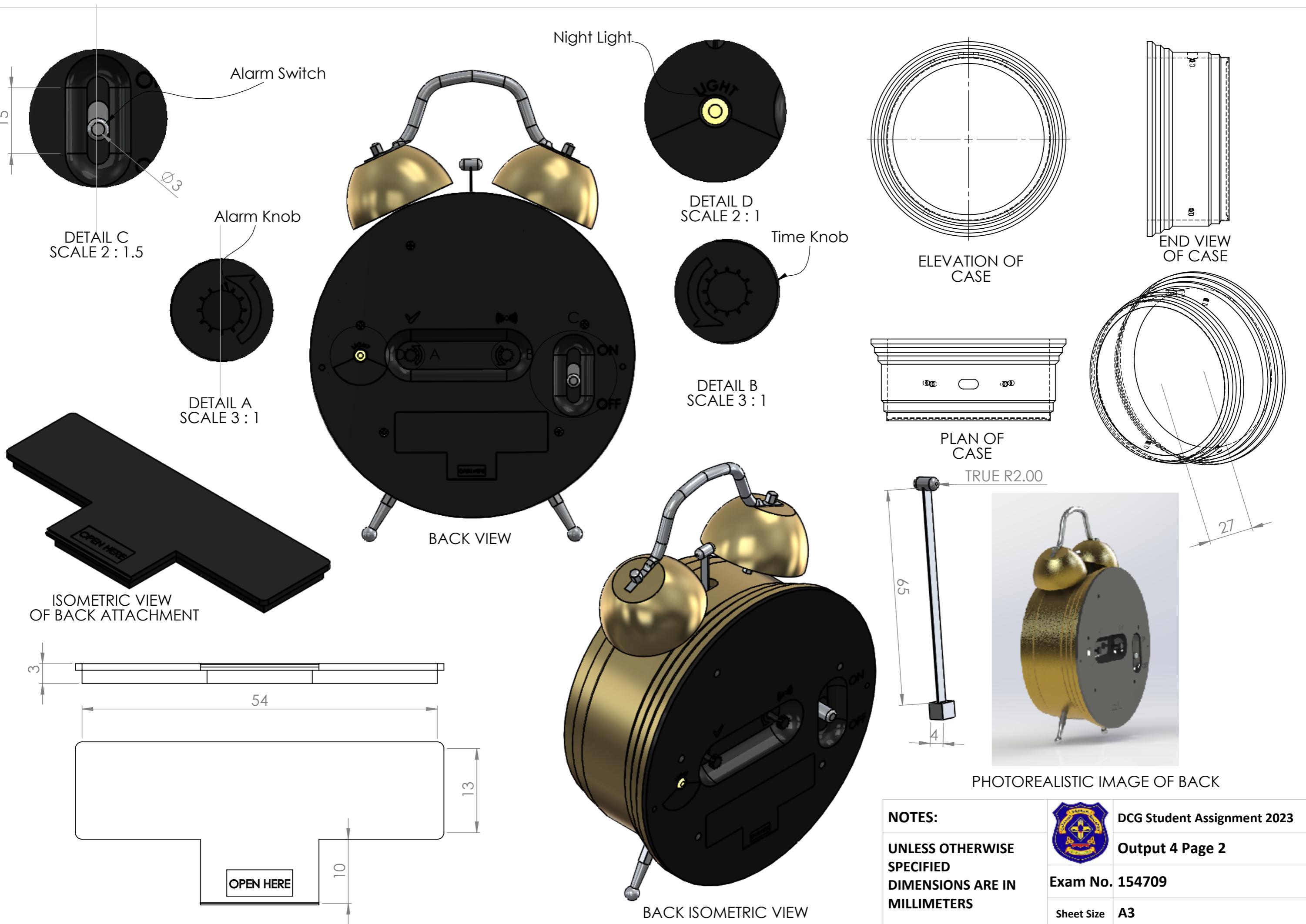


DCG Student Assignment 2023

Output 4 Page 1

Exam No. 154709

Sheet Size A3



OUTPUT 5 | GRAPHICAL EXPLORATION OF DESIGN SOLUTIONS

Exam Number: 154709

PAGE 1



BRIEF: THE PROBLEM

It is often the lack of motivation that may be caused by the over usage of phones in beds by children at the age of 7-14 who finds their lives not to be exciting enough to be awake to a new day. This can have consequent effects on the daily life of a child such as the resistance in waking up in the morning to go to school and dragging the sleep all the way until afternoon.



THE CONCEPT: MY SOLUTION



I fully agree to the brief so as to help this situation. I think a child should have a routine to begin each day of their life, which can be started off with an alarm clock that motivates the child to wake up in the morning. From my research, I noticed that according to Common Sense Media, 42% of kids have phone by age 10. By age 12 it's 71%, by age 14 it's 91%. Knowing that children loves cartoon, I think it would make perfect sense to create an alarm clock based on a cartoon character as it ergonomic for a child to understand and use, making it aesthetically attractive and functional for children while achieving the purpose of the alarm clock.



TARGET MARKET

- Nowadays, alarm clocks looks technical and is aimed towards the older age group, completely ignoring the significance of it for a child. Subsequently, their motive to wake up quenches and reduce their productivity during the day. The understatement of a cartoon based alarm clock can be proved to have an enormous potential in a child's growth.
- To combat this, my concept design should be purely for younger generations especially whom are addicted to phones during school lives. Therefore, my target market includes, children who loves cartoons, but predominantly focusing on children at the age of 7-14 who owns a phone, so this should be taken account for in the aesthetics of the design.

FUNCTIONALITY

- Although most alarm clocks, whether it be analogue or digital, it clearly shows the time and alarm the sound. However, majority of the digital alarm clocks are directed towards the adult market as it consists of a radio system and is lacking a motivational feature that inspires to wake up in the morning. Not only that, but also I feel the labels on the buttons are difficult for a child to comprehend and thereby making it baffling to use.
- Taking this into consideration, I aim to design an alarm clock that features a motivational/fun mechanism for children to enjoy that displays the time and sound off the alarm in a unique creative way while teaching them something as well. Due to children not being overly interested in radio, it will be replaced with something more appropriate to the children. Also, the buttons would be labelled by symbols as opposed to text for easy use.



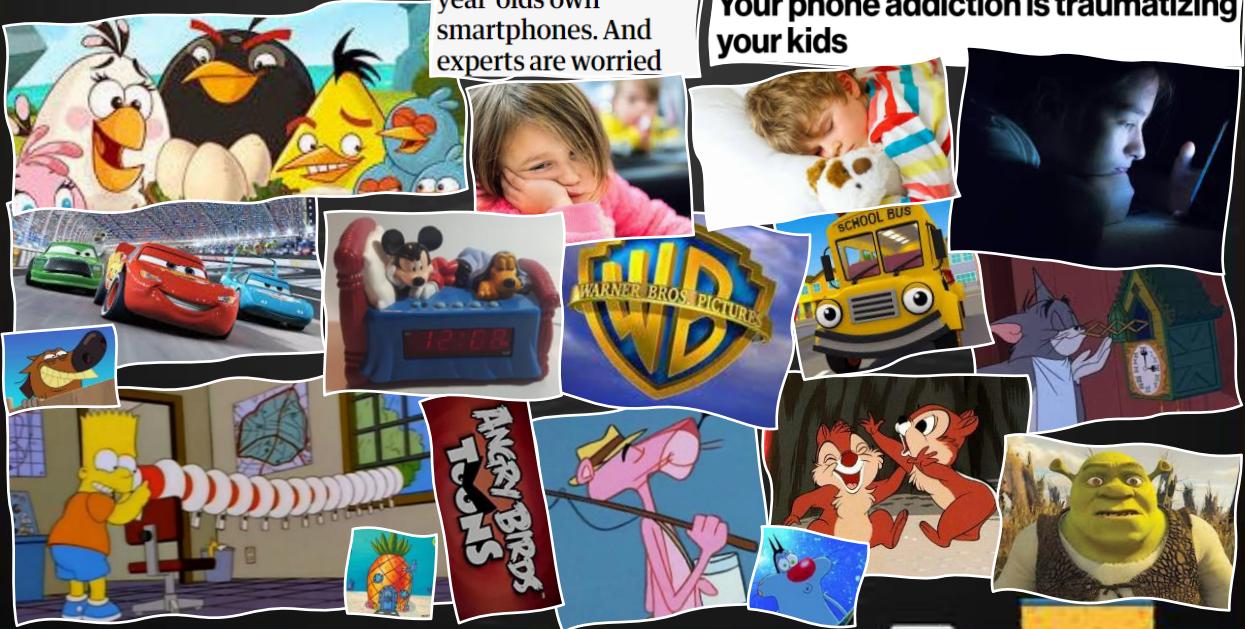
Confusing amount of buttons Innovative, motivational mechanisms



Unattractive machine-like alarm clocks not suitable for children



Mood Board



ENVIRONMENTAL SUSTAINABILITY

- The rise in digital alarm clocks are increasing which are powered by electricity. As it has to be constantly ran, this consumes excess electricity which can have a negative impact on the environment. I noticed that many alarm clocks is composed of plastics, especially digital ones which will release toxins and harm the environment.
- Keeping the safety of the user in mind, the material used should be of an insulator that is less harmful to the environment such as platinum silicone which acts as an insulator and is more eco-friendly than plastic. In addition, I may revert back to the mainspring mechanism of an alarm which uses negligible amount of electricity and is totally safe for the environment.



AESTHETICS

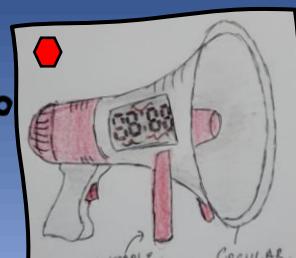
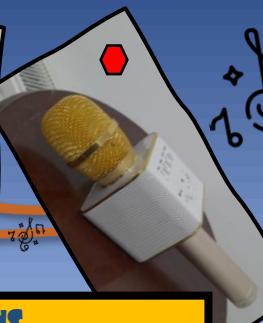
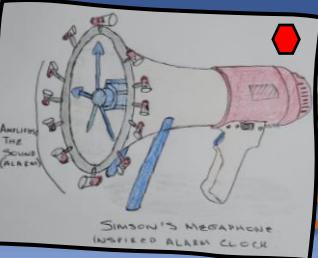
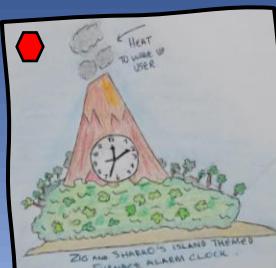
- I have noticed majority of the alarm clocks looks like a machine which is directed towards the adult population as opposed to a toy. The dull colours part of the design makes it not motivational for the child to wake up to, as well as the simple physical forms and shapes that alarm clocks diminish the overall attractiveness it has to offer, thereby diminishing the interactivity it has to offer.
- To resolve this, the child must have a bond with it and therefore it must have bright distinct colours, a simple yet complicated physical form combined with an attribute of a cartoon character to maximize the interactivity so that the child feels motivated to wake up to a toy that has an alarm feature on it rather than an alarm clock that has drawing designs.



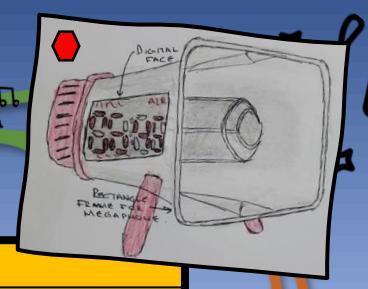
OUTPUT 5 | GRAPHICAL EXPLORATION OF DESIGN SOLUTIONS

Exam Number: 154709

PAGE 2



Circular Megaphone is unstable with legs



DESIGN 1

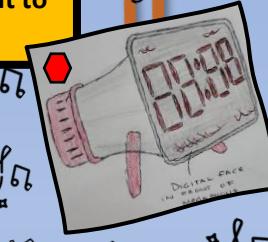
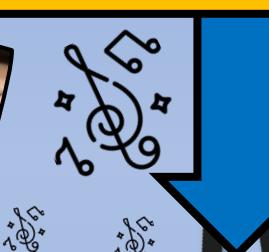
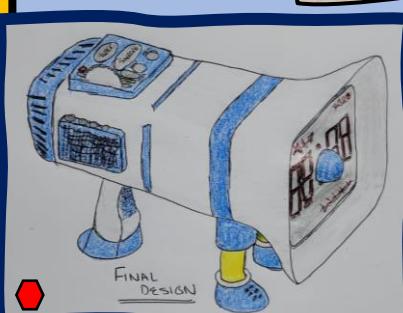
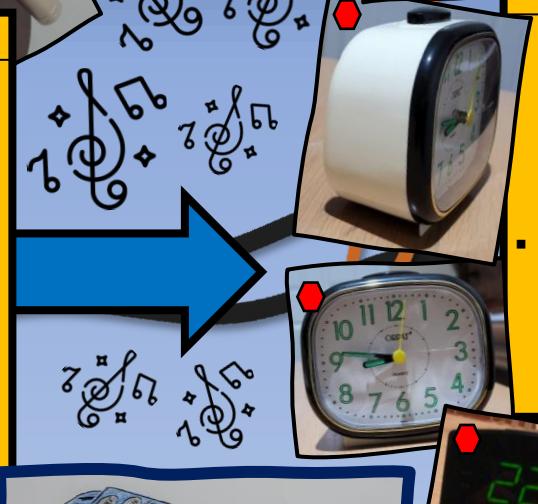
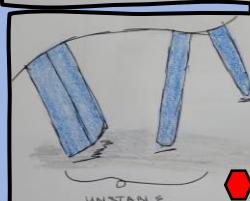
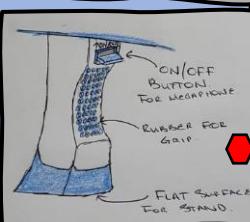
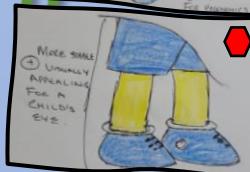
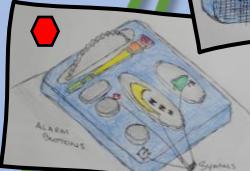
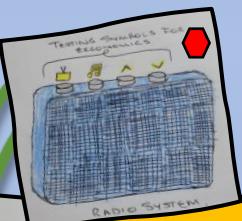
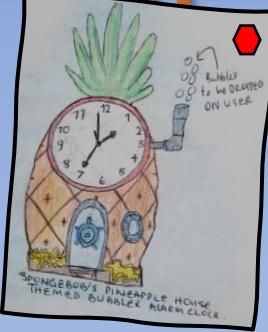
Upon investigation among the children in my community, they really enjoyed the dual object oriented design of the megaphone as they say it's more fun. To my surprise, they do not like too much bright colours. The children's parents suggested that there are safety hazards involved with the other designs of the furnace and bubble shooter.

- Taking their suggestion into account, I first reconsidered the physical form of the entire megaphone rather than it being circular. Then another problem was that the analogue version of this megaphone based alarm clock is difficult to read and it brought down the aesthetics of the design.

Digital face at an inconvenient spot

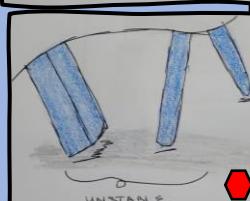
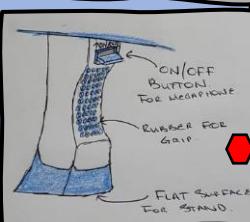
TESTING OF CONCEPT DESIGNS

- I wanted my alarm clock to have an interesting and fun mechanism for children to interact with and so I based my design on an appliance that would be attractive when aesthetics is applied to it. I started off with the setting of each cartoon or look at an appliance and see how I can add an alarm clock into it, including a cartoon attribute.
- For example, the volcano from 'Zig and Sharko' could heat the room ten minutes before the alarm. Or the pineapple house from 'SpongeBob SquarePants' could shoot bubbles as alarm or finally an alarm clock that could be used as a megaphone from 'The Simpsons' to amplify the manual alarm or the custom alarm by the children's parents.

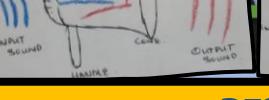
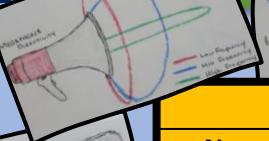


DESIGN 3

- Having the general look of the megaphone completed, I was able to move onto the aesthetics, ergonomics and the functionality of the alarm clock.
- My next focus was on the stand of the megaphone in which case the tripod formation would be the best including the handle. I tested it out on paper and it looked unstable so I reverted the handle backwards for that stability as well as flattening down the bottom surface of the stands.
- For aesthetics, I felt there was that cartoon attribute missing that motivates the child, so I added Homer Simpson's legs as the front two stands for the megaphone. This made me conclude that blue would be the best colour to match design inspired by the blue shorts and shoes.
- While radio being not suitable for children, I felt the need to include it for the educational reasons. Furthermore, I tested the symbols instead of text, it looked more confusing and hence I stuck with the labelled text for buttons for the radio and the alarm system.



My final design is a rectangular megaphone that is inspired by 'The Simpsons' to help motivate children to wake up to their favourite cartoon in the morning. As a knock-on effect, this will become a routine in their school lives and hopefully helps them to be organised and find life more exciting through a simple yet playful design.



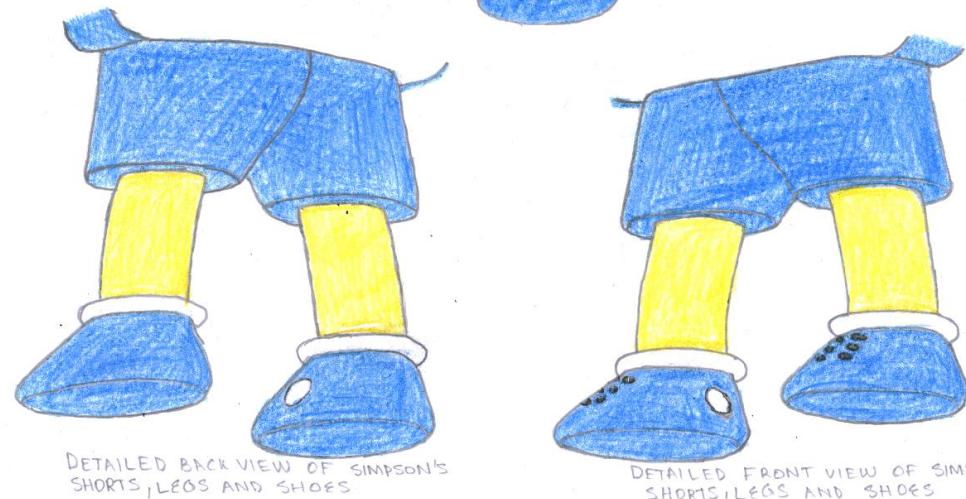
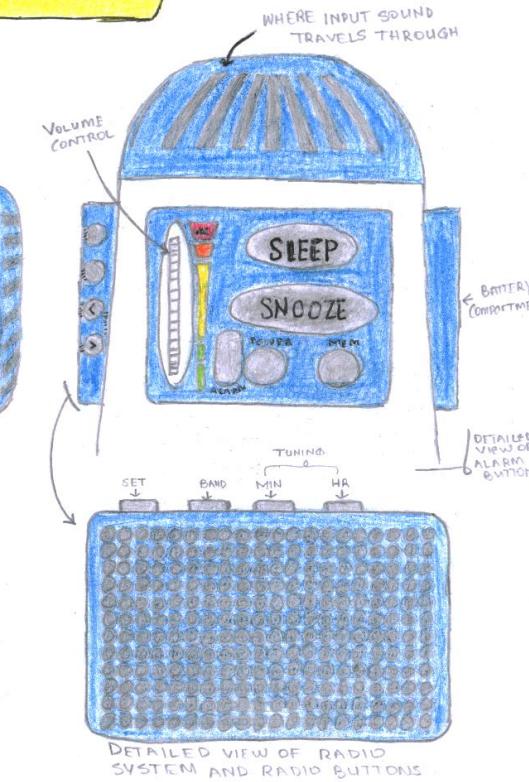
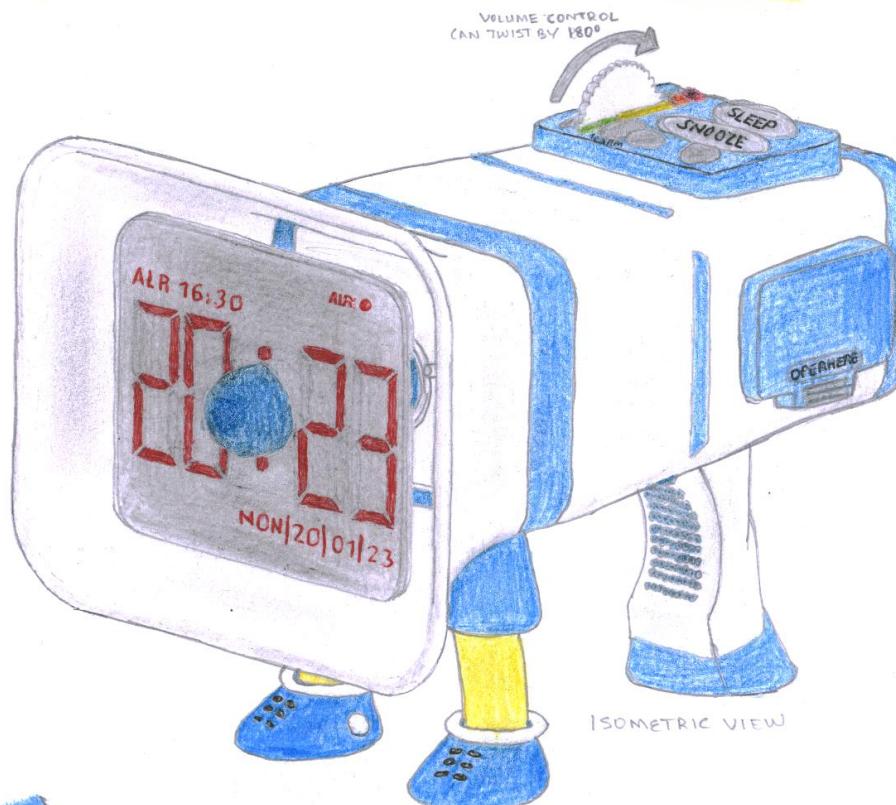
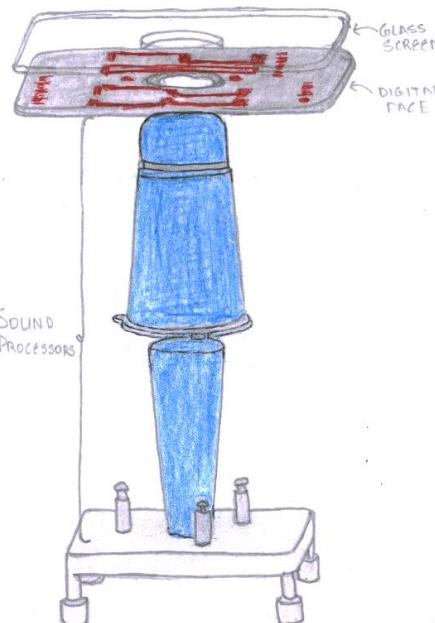
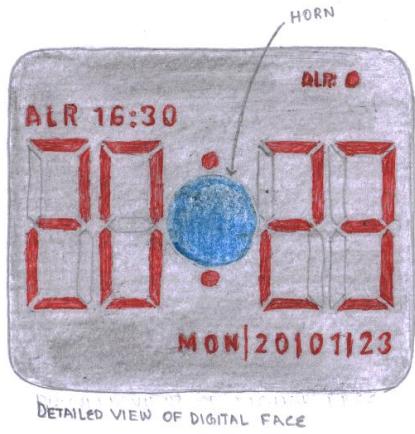
DESIGN 2

- Now that I figured out what physical form this megaphone should take, I re-evaluated my megaphone in terms of its technicality. Upon research, I noticed that the input sound is being vibrated multiple times inside the horn and the processor before coming out as the output sound which means the front cannot be completely blocked off. This shows why the circular version is better for technical purposes. As I valued the aesthetics of the design more, I decided to continue with the rectangular form for stability on the legs. I also had to value its intent and thus I used the digital version powered by battery reducing the danger of it.
- Keeping in mind that the frequency of the sound is the highest around the width and lowest in the height, I designed a digital face that could be held by the horn and it does not completely block off the front as well as its width being larger than the height to maximize the output sound.

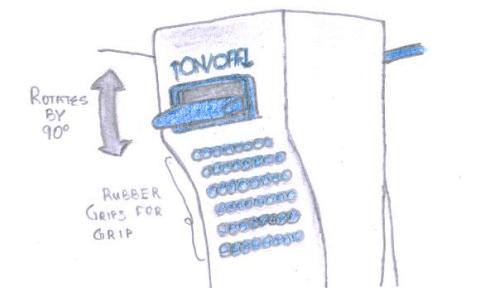


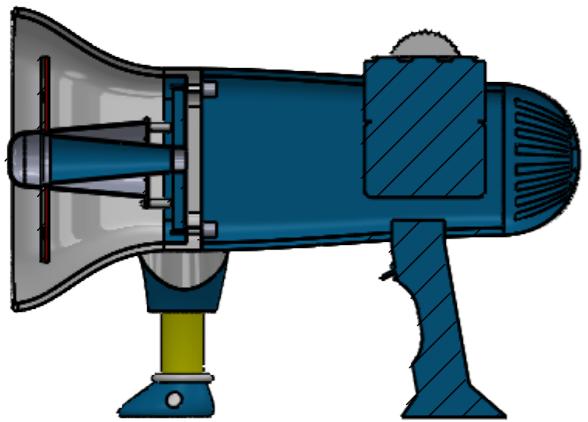
OUTPUT 6 | PRESENTATION OF CONCEPT DESIGN

EXAM NUMBER : 154709

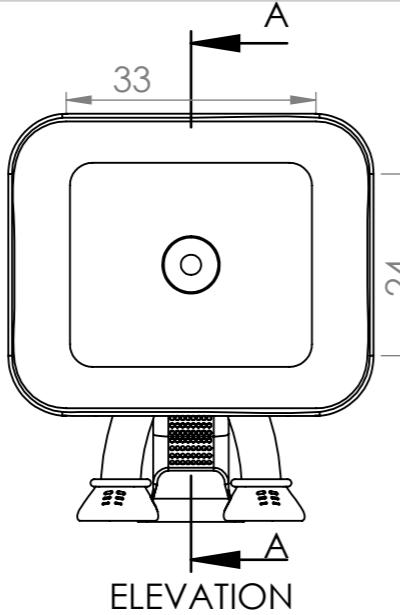


DETAILED FRONT VIEW OF SIMPSON'S SHORTS, LEGS AND SHOES

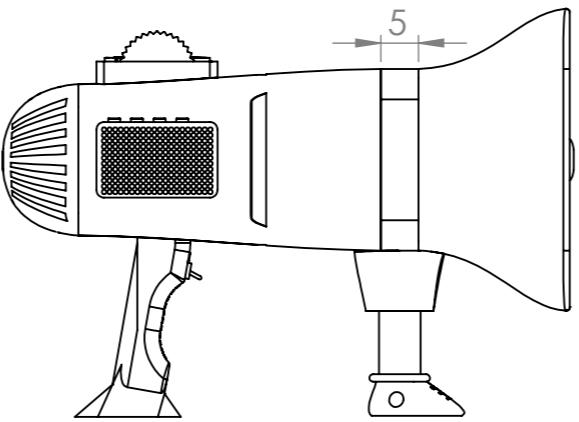




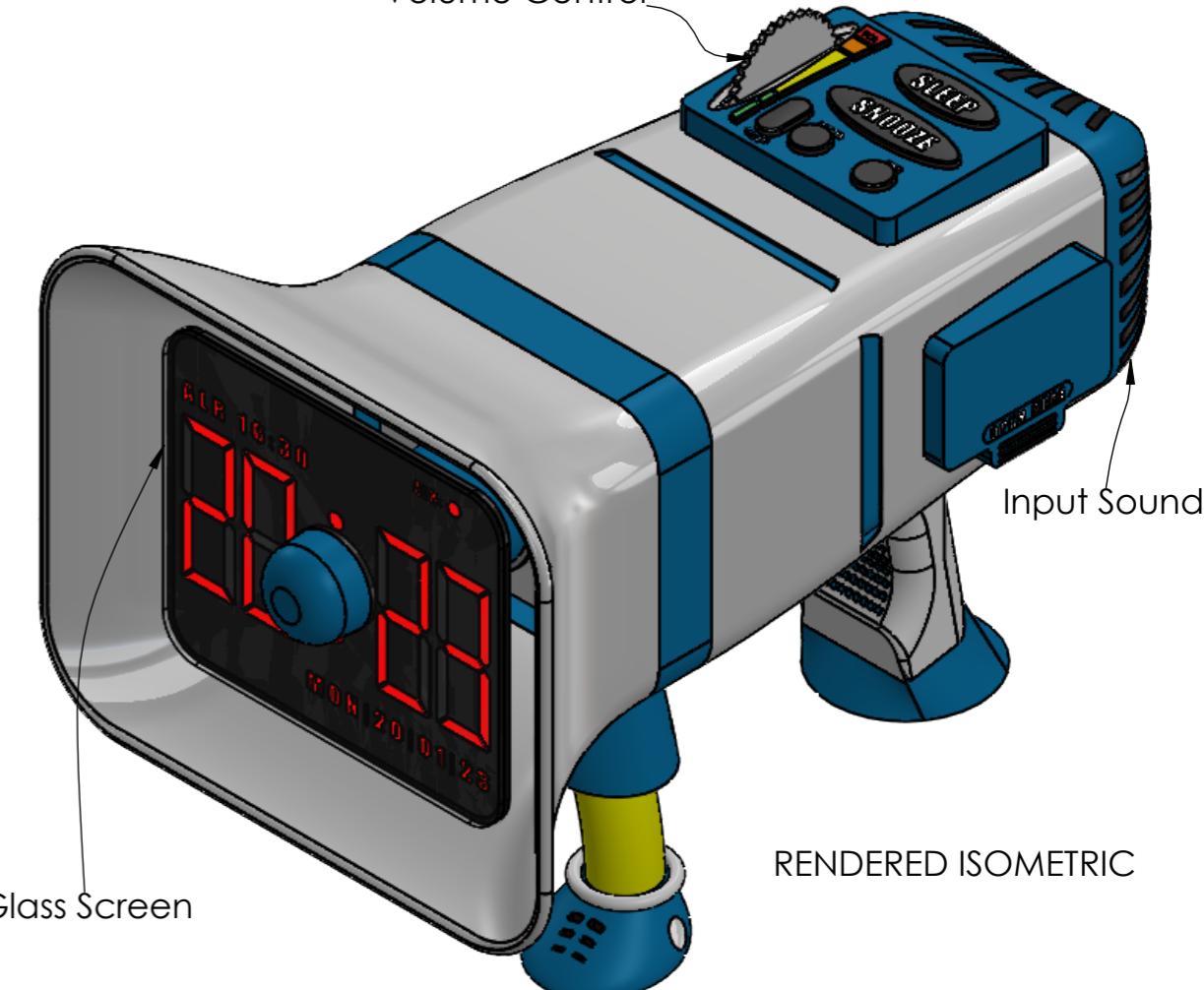
SECTION A-A
SCALE 1 : 1



ELEVATION

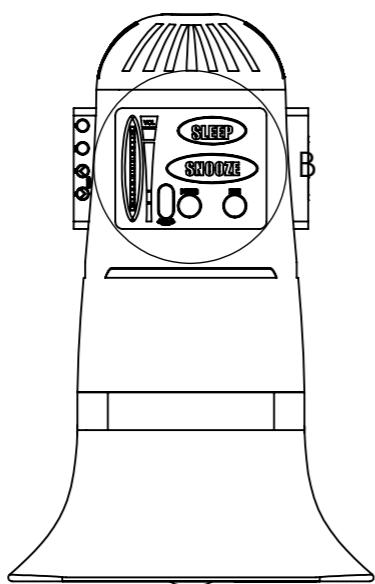


END VIEW

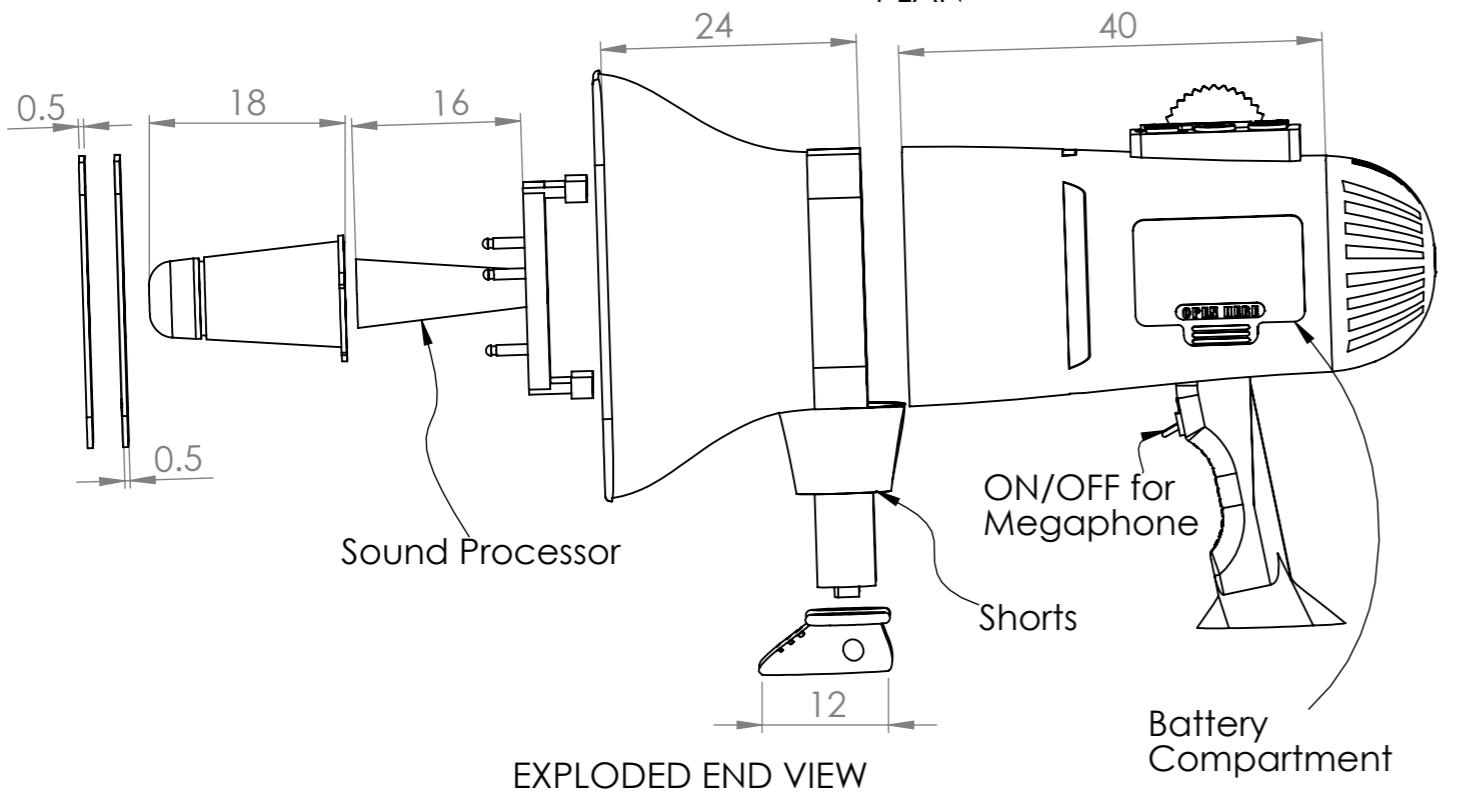


RENDERED ISOMETRIC

ITEM NO.	PART NUMBER	QTY.
1	Front Body	1
2	Middle Body	1
3	Sound Processor	1
4	Horn	1
5	Shoe	2
6	Digital Face	1
7	Glass Screen	1



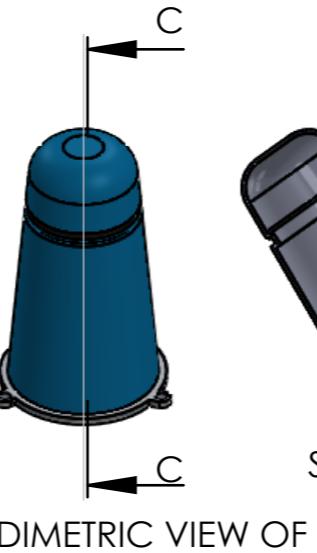
PLAN



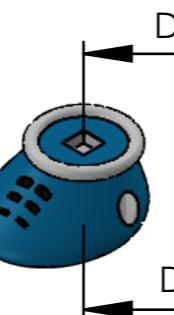
EXPLODED END VIEW



DETAIL B
SCALE 1:1



SECTION C-C



ISOMETRIC VIEW OF SHOE



PHOTOREALISTIC IMAGE

NOTES:

UNLESS OTHERWISE
SPECIFIED
DIMENSIONS ARE IN
MILLIMETERS



DCG Student Assignment 2023

Output 7

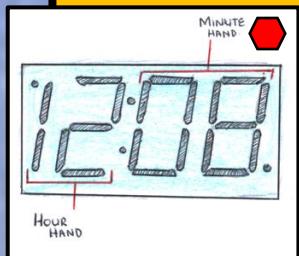
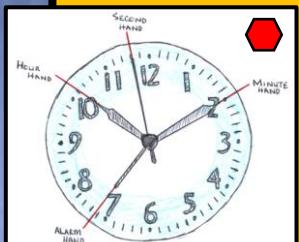
Exam No. 154709

Sheet Size A3

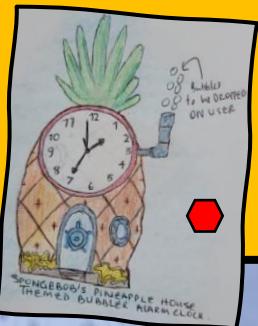
REFERENCE PAGE

Exam Number: 154709

PRIMARY RESEARCH AND SKETCHES



All the primary research (photographs, scans and sketches) in my project are marked by a red hexagon as shown in the examples. All photographs marked as such were taken by me. All the sketches in the project are my own.



OUTPUT 1: TIMELINE OF ALARM CLOCK

- Alarm Clock History
- Alarm Clock – Wikipedia
- atlasobscura.com
- timetoast.com
- history.fandom.com
- brandstand.com
- bionity.com
- me588_2012f.pdf (umich.edu)
- Google images
- Primary Research

OUTPUT 1: COMPARE & CONTRAST

- Google Images
- My own sketches
- Primary Research
- me588_2012f.pdf (umich.edu)
- argos-support.co.uk/storage/uploads/2466532-94172.pdf?direct
- youtube.com/watch?v=6sVPDI8-dSM

OUTPUT 7 : PAGE 2

- Primary Research
- My own sketches
- Google images

OUTPUT 1: DESIGN RESEARCH

- Google images
- heimvision.com
- nbcnews.com
- nytimes.com
- health.com
- cnn.com
- Primary research
- My own Sketches

OUTPUT 7: PAGE 1

- Google images
- etsy.com
- me588_2012f.pdf (umich.edu)

SOLIDWORKS ALARM CLOCK DESIGN

For the designs in solidworks, the recommended amount of parts you should have ranges between 5-10. My part A has 12 parts. However, all these parts are not unique as I added certain parts twice (e.g. hexagonal pins). This was done to achieve the goal of providing the users with the maximum functionality and aesthetics. Therefore, I believe these parts should not be considered as extra/separate parts on my solidworks.