DESIGN & COMMUNICATION GRAPHICS

Exam Number: 259109

SolidWorks Version: 2023

Design Research - Output 1

Timeline of Microphones

1827 - "Microphone"
Sir Charles Wheatstone coined the phrase "Microphone". The term was used to describe an acoustic device, like a stethoscope, which he had developed to amplify weak sounds.

1878 – Carbon Microphone
Form the basis to many of the microphones still in use today

1920 – Electonic Vacuum Tube Amplifier
gave greater volume output for devices such as the microphone.

1942 – Ribbon Microphone
was invented for the new format of radio broadcasting.

1957 – Wireless Microphone
Were very large and heavy

1983 – MEMS Microphone
Had a lower power consumption.

2003 – Digital Microphone
Had better sound free interference.

2010 – Democratised wireless microphone
Has no cable attaching to the sound system/ amplifying equipment.

1876 – First Microphone
used as a telephone transmitter.

1916 – Condenser Microphone
can also be referred to as a capacitor or electrostatic microphone.

1917 – Piezoelectic Microphone
A device that turns sound waves into electrical signals.

1931 – Omni Directional Dynamic Microphone
Was designed to pick up sound from all directions.

1948 – Multi-Pattern Microphone
Could be used to reduce feedback for vocal singers.

1962 – Electret Microphone
offered greater reliability, higher precision, lower costs and smaller size and revolutionized the microphone industry

1990- KMS 105
the condenser model for live performances.

Physical Form, Features & Shape
- Microphones are shaped the way they are for comfort. They are also shaped that way because of engineering – the mechanics of a microphone fit the best into this shape.
- Microphones also have a circular top to pick up sound waves equally from all directions.
- The microphone has an adapter located at the bottom to plug it in.

Material
The case of the microphone is usually made from aluminum sheet or plastic

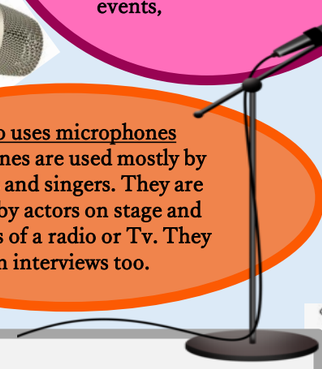
What other electronic devices use microphones
- Telephones
- Hearing aids
- Megaphones
- Radio & TV broadcasting
- Motion picture production
- Computers
- Public address systems for concert venues and public events,

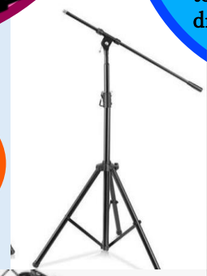
Ergonomics
The handle of a microphone is shaped for comfort and can accommodate most people's hand. It cylindrical in shape to ensure its not dropped

Dynamic, condenser and ribbon microphones are the most common types

Neumann KM184
It was first made in 1992, designed by Georg Newman. They are a good stage mic for recording classical/ acoustic guitars

Who uses microphones
Microphones are used mostly by musicians and singers. They are also used by actors on stage and presenters of a radio or Tv. They are used in interviews too.

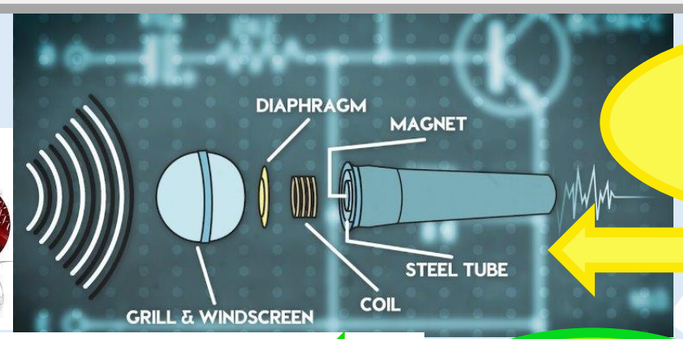




Brief

External microphones are used to amplify and record sound while producing podcasts, broadcasting, streaming and performing. Some external microphones are handheld, while others come with stands, tripods, boom arms, pop filters, and other accessories. They can be connected to devices such as laptops, mixing boards, speakers and cameras in a variety of ways. The choice of materials, colour schemes, inclusion of integrated lighting and the underlying geometry of the component parts and accessories has a strong influence on a microphones look and feel.

(a) carry out a design investigation of existing external microphones in graphic format. Your investigation should include an analysis of physical forms and shapes, geometry, materials, ergonomics, etc.



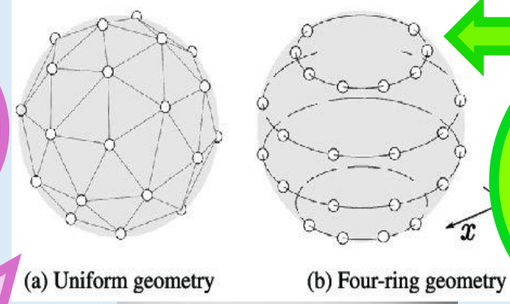
Parts
A modern dynamic microphone consists of a diaphragm, a coil or capacitor, a magnet, a steel tube and a grill and windscreen.

Lavalier microphone
They are small and are usually clipped to clothing during an interview or presentation

What is a microphone ?
A microphone is a device that converts sound waves into an electrical signal. This allows for audio to be captured and transmitted to other devices like speakers, computers or recording equipment.

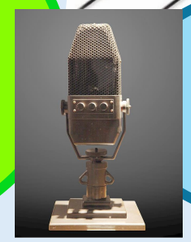
Coles 4038
It was first built in the 1950's when the BBC sought to develop a cheaper alternative to the RCA 44BX in the US, with their own specifications. The Coles 4038 would often be considered as the best choice for drum overheads.

Shotgun microphones
They are directional microphones. They are long and narrow and are used for capturing noise in a certain direction in a noisy environment. They are often used by reporters.

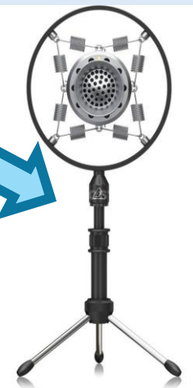


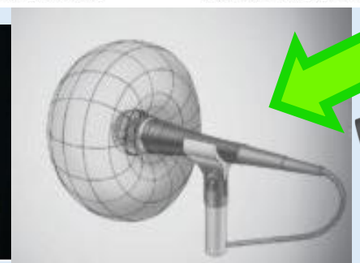
Geometry
There are two types of microphone geometry:
- uniform geometry (each circle represents microphone pair)
- four-ring geometry (each circle represents spherical microphone array).

The handle of the microphone is cylindrical and moves into a conical shape.

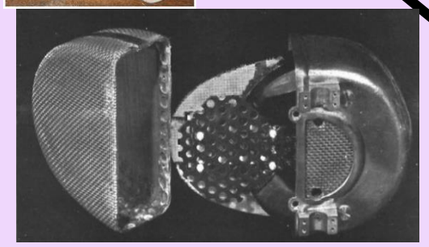


Behringer BV635
This microphone has a 1930's vintage look. It's ideal for podcasts. It has exceptional frequency response and ultra-high sound resolution and can be used with acoustic instruments.

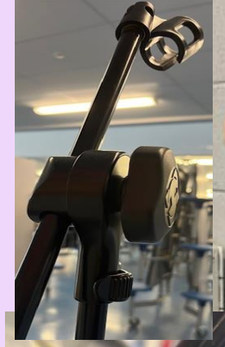


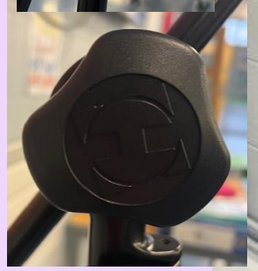


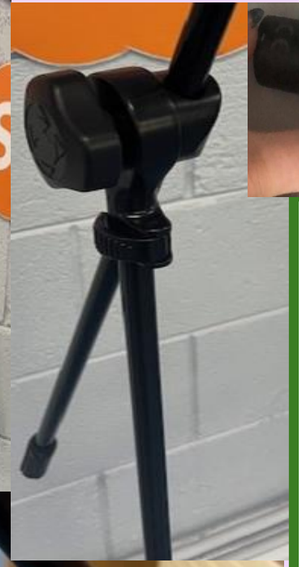
Shure SM7B
It's a dynamic microphone used for vocal recording and broadcasting. It's durable with excellent sound quality.



Primary images of a microphone stand & microphone in my school







Dynamic Microphone – Shure SM58 SE

Output 2 – Design feature Comparison

Compare & Contrast

Ribbon Microphone - BBC-Marconi Type A

Product overview
A ribbon microphone, also known as a ribbon velocity microphones, are typically bidirectional, meaning that they pick up sounds equally well from either side of the microphone. In May 1931 RCA demonstrated their ribbon mic in Hollywood and it came to the BBC's notice. However, the price, was £130 which in today's money is around £5200. As this was not affordable, the BBC set about designing its own version, which was introduced in 1934-1935 as the Type A microphone.

When they were used
Ribbon microphones were used from the mid 1940's – the 1970's.

Components
Consist of a thin strip of corrugated aluminum suspended loosely between two magnets connected to a transformer.

Materials
They used a thin aluminum of electrically conductive ribbon placed between the poles of a magnet to produce a voltage by electromagnetic induction.

Ergonomics
They were not handheld and were usually placed 2 feet infront of a person on a stand.

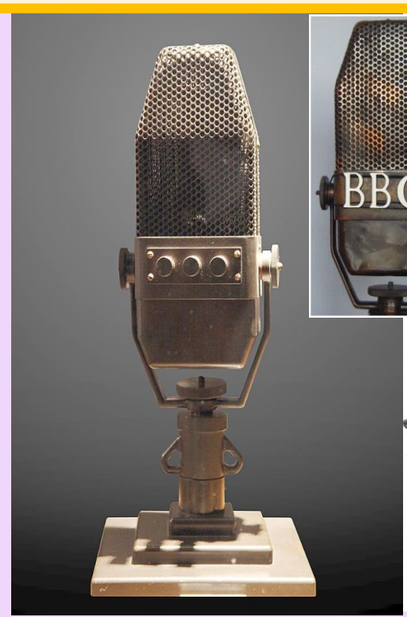
Cost
£9 in the 1940's which is the equivalent to £360 in today's money.

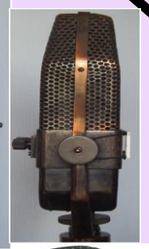
Target Market
They were used by the BBC for radio broadcasting.

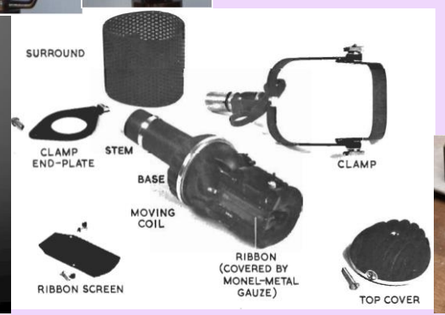
Frequency Range
4500 Hz

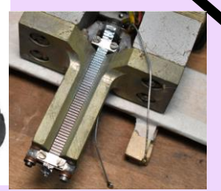
Disadvantage
These microphones were not suitable for outdoor use and could easily be damaged by wind.

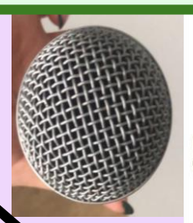
Conclusion
Overall, the Shure SM58 is a more durable microphone. It has withstood the test of time and is the most popular microphone used for vocal performances today. While the Type A Ribbon Microphone was bidirectional and had good sound quality it could not be used outdoors, so it was not used for live performances in stadiums. It was mainly used by the BBC for radio presenters. The Shure SM58 is also a cheaper microphone and could be held by the performer. The Type A Ribbon Microphone, again shows how it was mainly suitable for radio presenters, as it was not handheld. The SM58 also had a far better frequency range than the Type A. furthermore the SM58 Microphone is a much simpler design and has less parts making it cheaper than the Type A microphone to manufacture. It is clear from this that the SM58 is the better microphone.











Product overview
Dynamic microphones are the most popular type of microphone used today. The Shure SM58 was produced by Shure Incorporated. They are durable and affordable.

When they were invented
It was invented in 1966 and is still in use today.

Components
They are typically handheld with a cylindrical top and a metal grill.

Materials
They are generally made from microfiber steel.

Ergonomics
They are designed for comfort when held as they are often used by performing singers and have an integrated, air-cushioned shock absorber to minimise grip noise.

Cost
Usually cost around €100.

Target Market
It's the most popular performance microphone, used by singers in interviews and when giving speeches. It is made to target the main sound source while minimizing background noise and is unaffected by wind unlike the Type A Ribbon Microphone.

Frequency range
0.05 khz - 15 khz

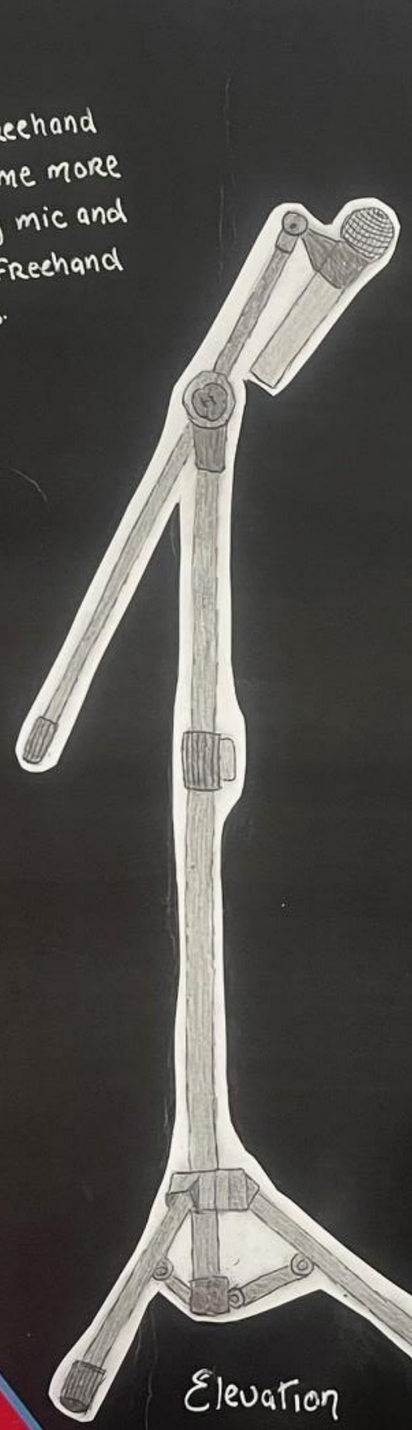
Disadvantage
It's not the best microphone to use for instruments e.g., guitars and drums as it was made for vocals.

Output 3 - Freehand Graphical Representation

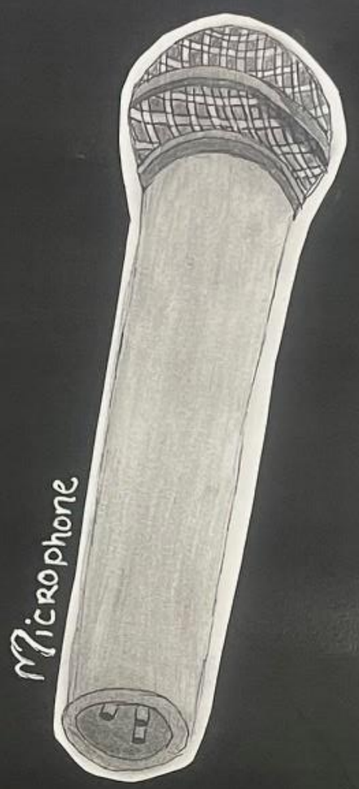
Exam No: 259109

Reflection:

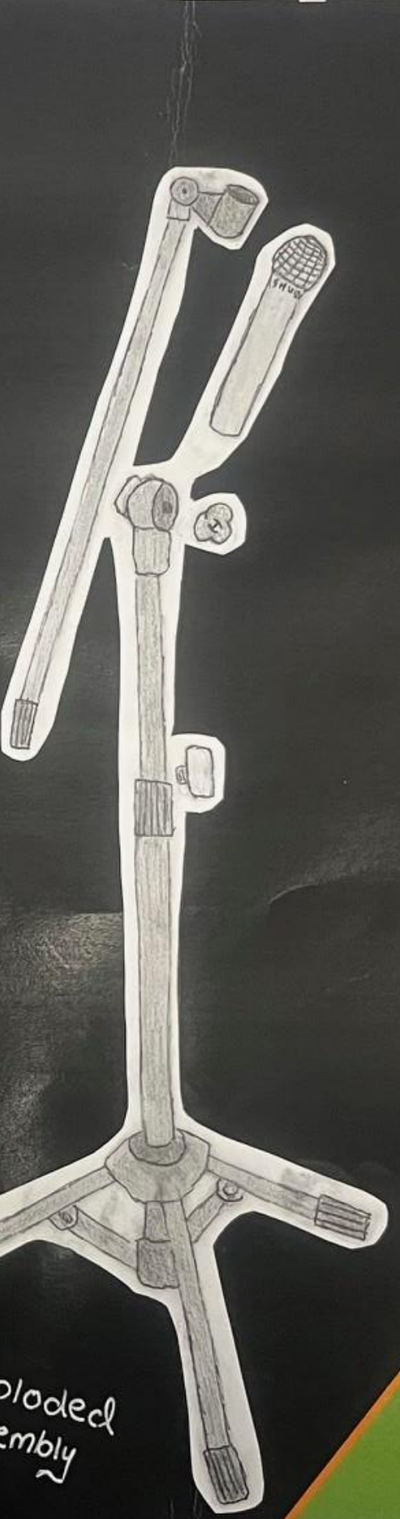
By doing these Freehand sketches I became more familiar with my mic and improved my Freehand sketching skills.



Elevation



Microphone



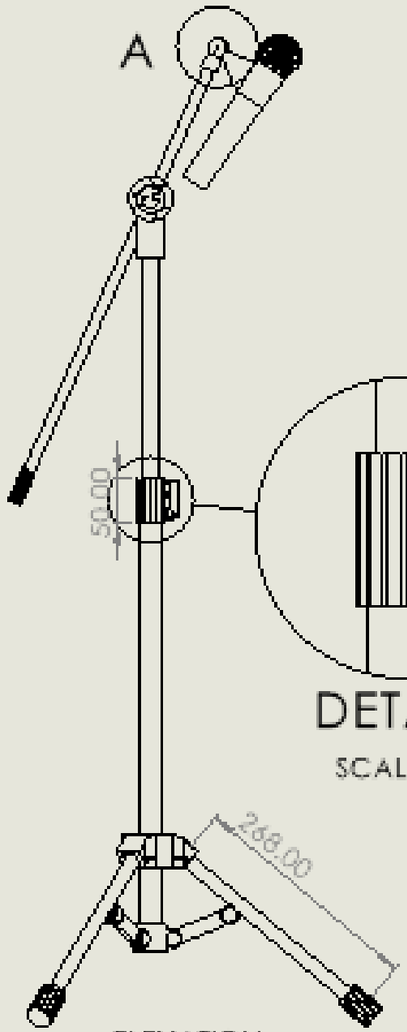
exploded assembly

Screw

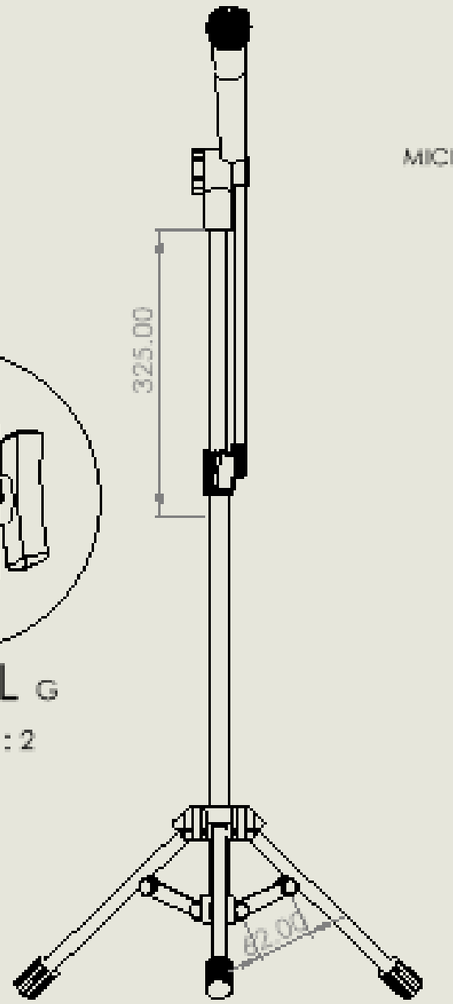
I used pencil and pen to create these drawings

Dial on Mic Stand

Dial on Tripod



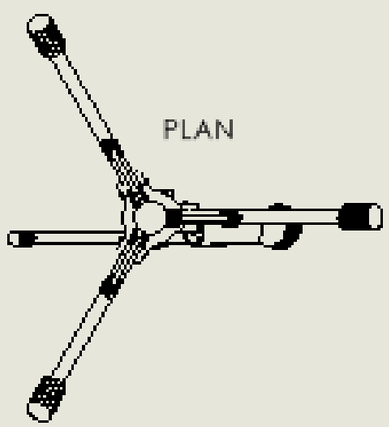
ELEVATION



END-VIEW

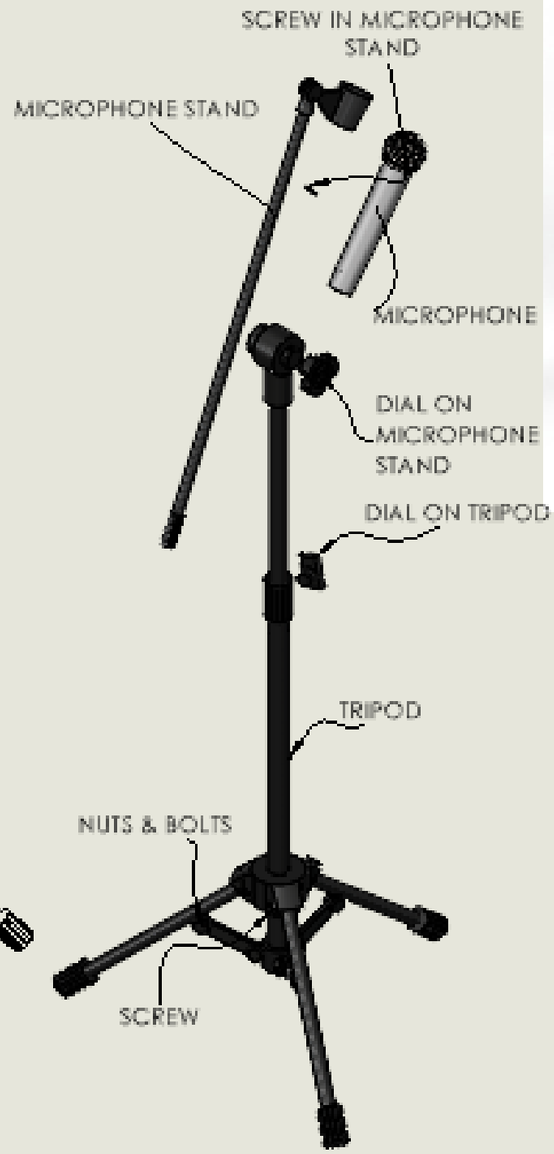
DETAIL G

SCALE 1 : 2

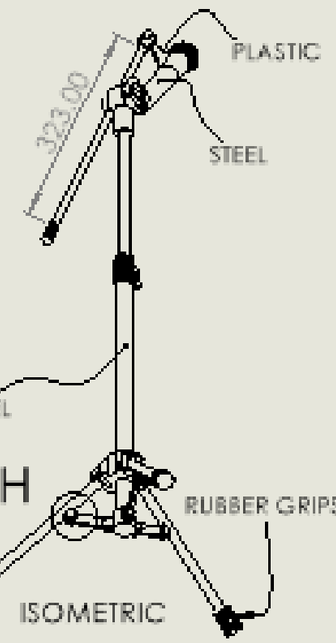


PLAN

RENDERED EXPLODED ISOMETRIC



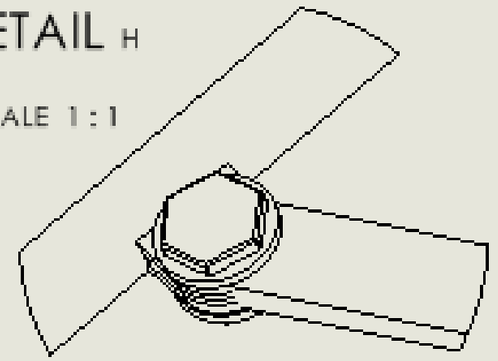
PHOTOREALISTIC 3D MODEL

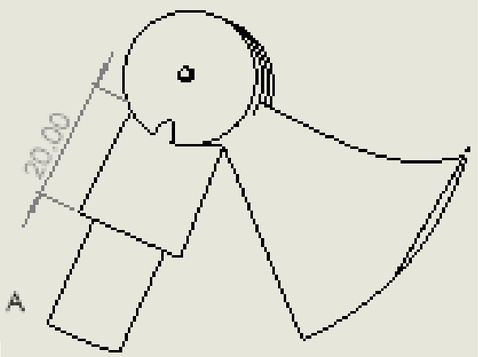


ISOMETRIC

DETAIL H

SCALE 1 : 1





DETAIL A

SCALE 1 : 1

ITEM NO.	PART NUMBER	QTY.
1	Adjustable Tripod	1
2	Microphone Stand Holder	1
3	Screw for Microphone Holder	1
4	Nuts & Bolts	6
5	Screws	6
6	Dial on Microphone Stand	1
7	Dial on the Tripod	1
8	Microphone	1

TECHNOLOGY SUBJECTS SUPPORT SERVICE

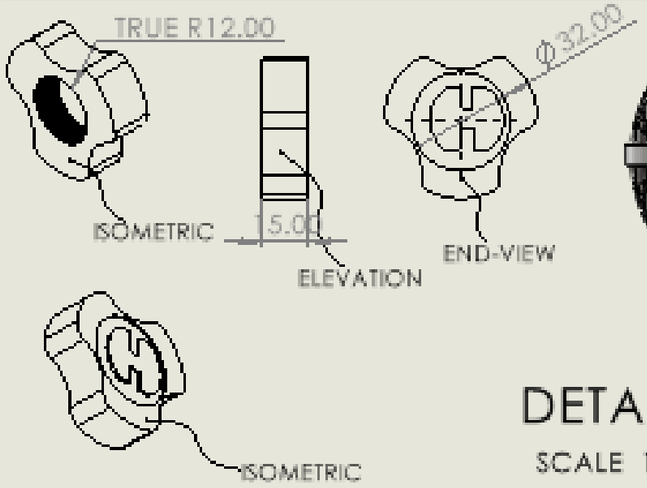
DESIGN & COMMUNICATION GRAPHICS

TITLE: Assembly of Microphone

DRAWN BY: YOUR NAME HERE | SIZE A3 | UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN mm

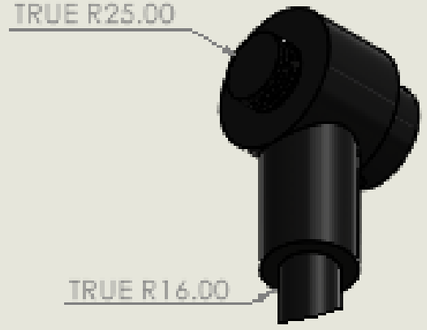
SCALE: 1:7 | DATE: 23/01/2025 | SHEET 1 OF 2

DIAL ON MICROPHONE STAND - 1:2



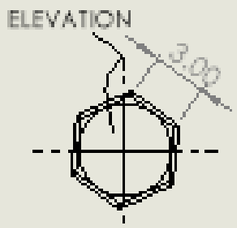
DETAIL B

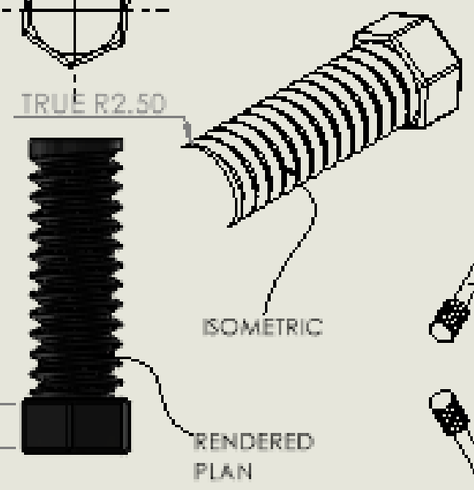
SCALE 1 : 1

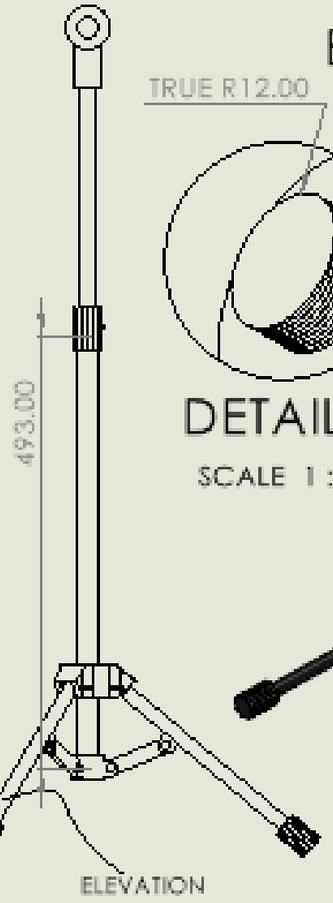


DETAIL E

SCALE 1 : 2



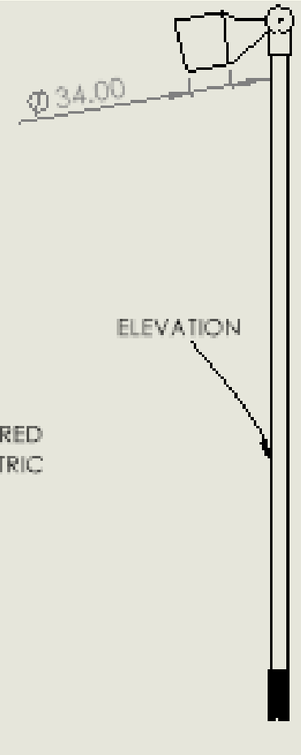




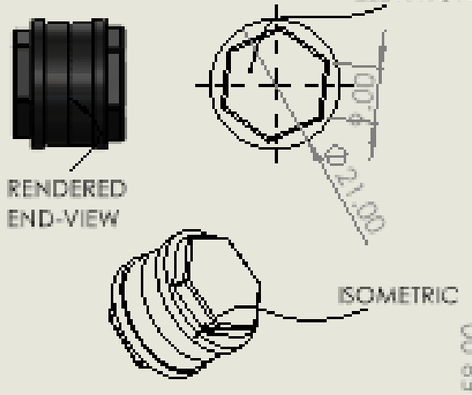
DETAIL F

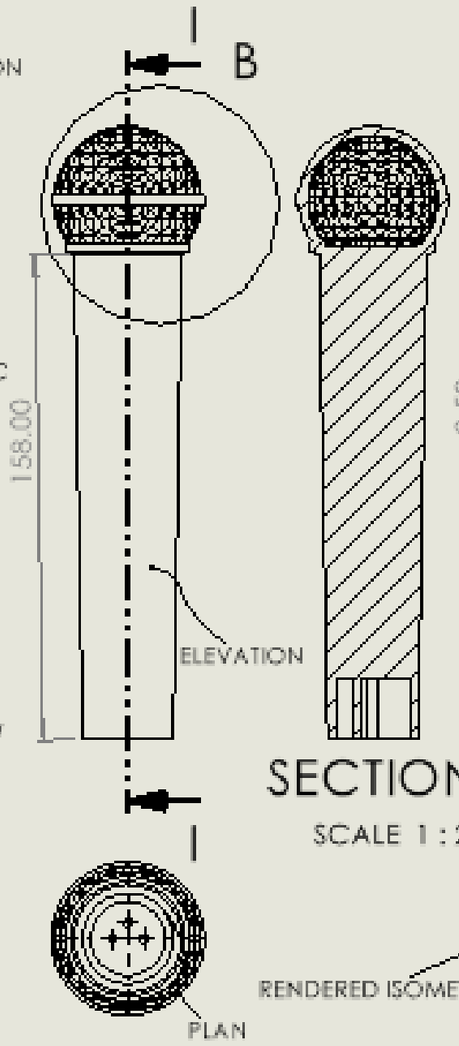
SCALE 1 : 1

MICROPHONE STAND - 1:5



NUTS & BOLTS - 1:1



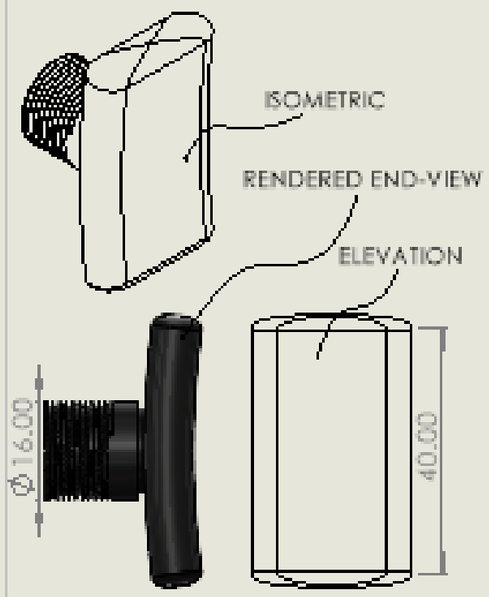


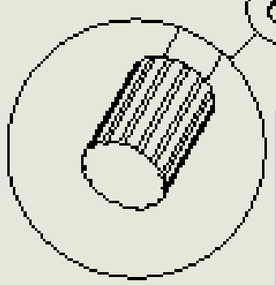
SECTION I-I

SCALE 1 : 2

MICROPHONE - 1:2

DIAL ON TRIPOD - 1:1

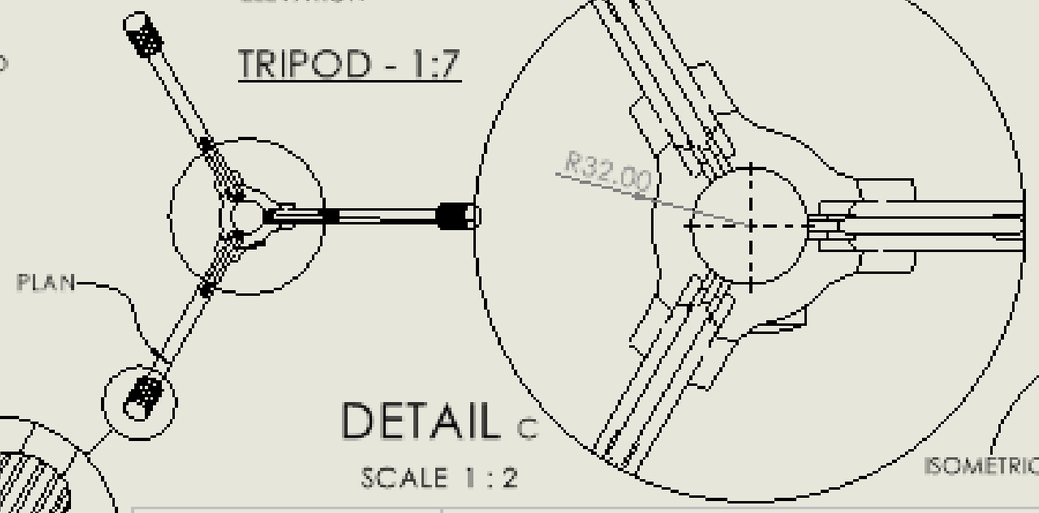




DETAIL D

SCALE 1 : 2

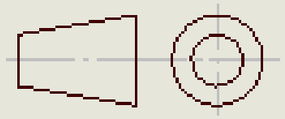
TRIPOD - 1:7



DETAIL C

SCALE 1 : 2

TECHNOLOGY SUBJECTS SUPPORT SERVICE



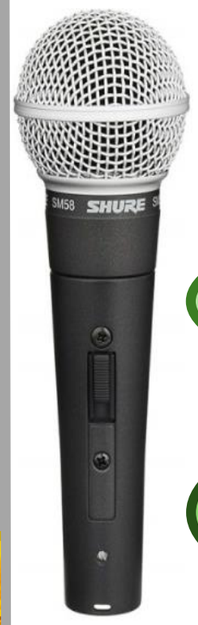
DESIGN & COMMUNICATION GRAPHICS

TITLE: Assembly of Microphone

DRAWN BY: YOUR NAME HERE	SIZE A3	UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN mm
SCALE: 1:7	DATE: 23/01/2025	SHEET 2 OF 2

Output 5 – Graphical Exploration of Design Solution

(b) Develop and graphically communicate a new concept design for an external microphone based on a selected theme or target market.



Theme

After some consideration I decided to choose the theme of nature (specifically flowers) and sustainability for my microphone. For the aspect of nature I will focus on flowers and for sustainability I will focus on solar energy.

Target Market

My microphone will be targeted at singers. The internal workings of the microphone could be made to a lower standard, and this microphone could be targeted at children too.

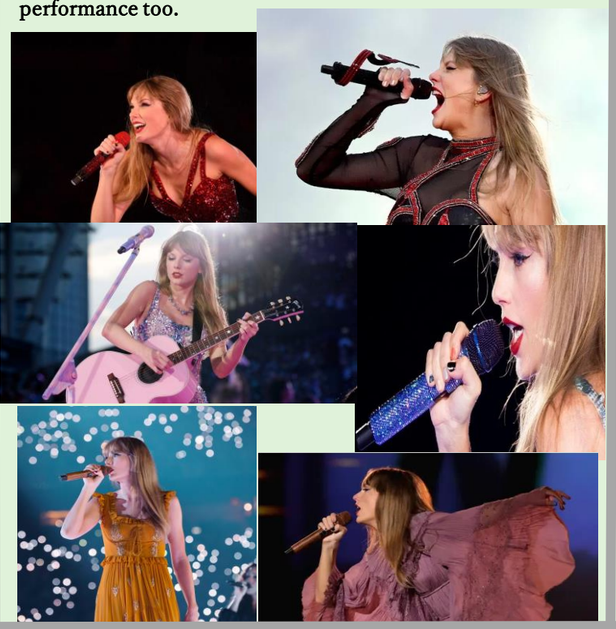
Aesthetic & Sustainability

The flower design will add more creativity to microphones, they will be solar powered and will be made from plant-based materials rather than plastic, they will make concerts more sustainable and older & broken toys more recyclable.

Real World Inspiration

Many artists use microphones with different designs to either represent the different themes of their concert or add creativity and colour to their performance. Many singers also try and make their concerts more sustainable. I love attending concerts and listening to music while going for walks. I'm also passionate about sustainability. This is why I have decided to use nature as inspiration for my design.

Taylor Swift is an artist who uses different styles of microphones for her performances. For her Era's Tour she changes her microphones for every era. Over the three-hour performance and 10 different era's she goes through 7 microphones. Taylor uses Shure microphones for her performance too.



Coldplay are trying to make their Music of the Speres tour as sustainable as possible. Coldplay aimed to reduce their carbon emissions for tour by 50%. They have kinetic floors to produce power and bikes for fans to cycle to power the tour. Furthermore, for every ticket bought for the concert a tree is planted – 70 million trees so far. Their wristbands are made from compostable plant-based material..

Output 5 – Further Graphical Exploration of Design Solution

Advantages & Disadvantages of Alternative Microphone Ideas

Lily;

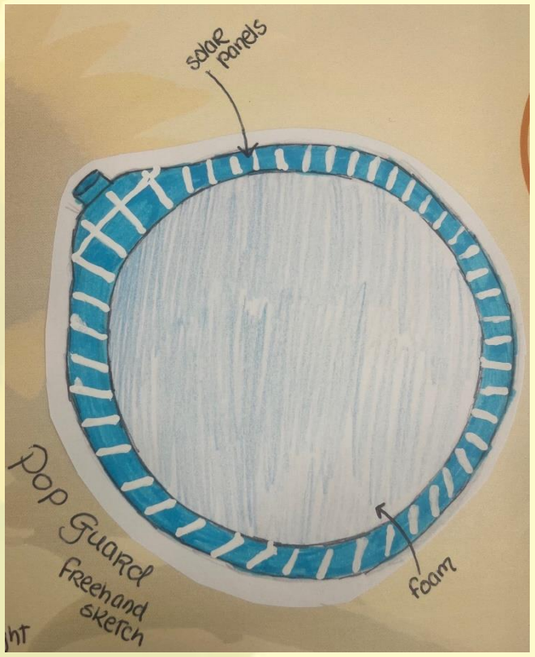
It would be hard to replicate the colours and designs on the petals in SolidWorks. However, the shape of the leaves and petals would make it look very aesthetic.

Rose;

It would be difficult to make the shape of the flowers around the mic head in SolidWorks. The vivid red colour would make it look very vibrant in a performance.

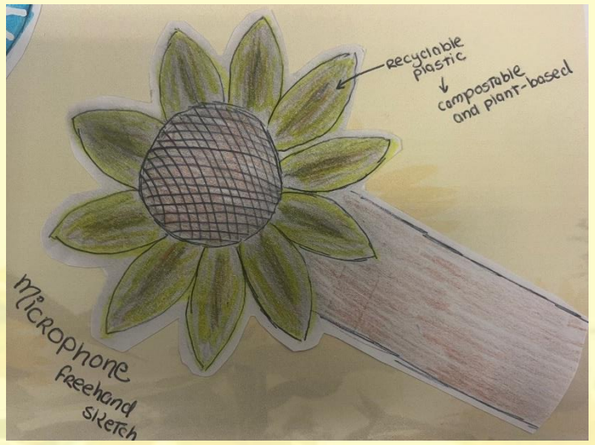
Bluebells;

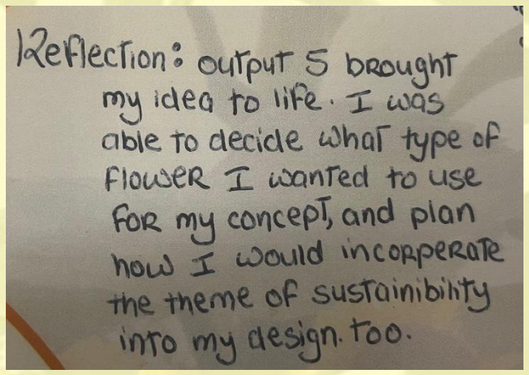
If I turned my microphone into a bluebell, I don't think the shape of the flower would look good around the head of the mic, but like the rose and lily mic the colours would have made the mic look unique and nice.



Sustainability

Any part of the mic that is plastic will be made from plant-based plastic that is compostable, and the rest will be made from a light steel. The rim of the pop guard will be made of solar panels to fuel the microphone with solar energy. The pop guard is located above the mic and will be ideal for capturing the sunlight.





Development of Idea

I decided to choose the sunflower mic for my concept idea because it is my mum's favourite flower and the yellow makes the usually dark, bland mic seem more cheerful.

I learned from Part A that it's important to have an adjustable tripod and stand so that it's easy to transport the mic around. In my concept I made sure to keep the stand adjustable so despite the mic itself being less functional the stand and tripod are still portable and functional.

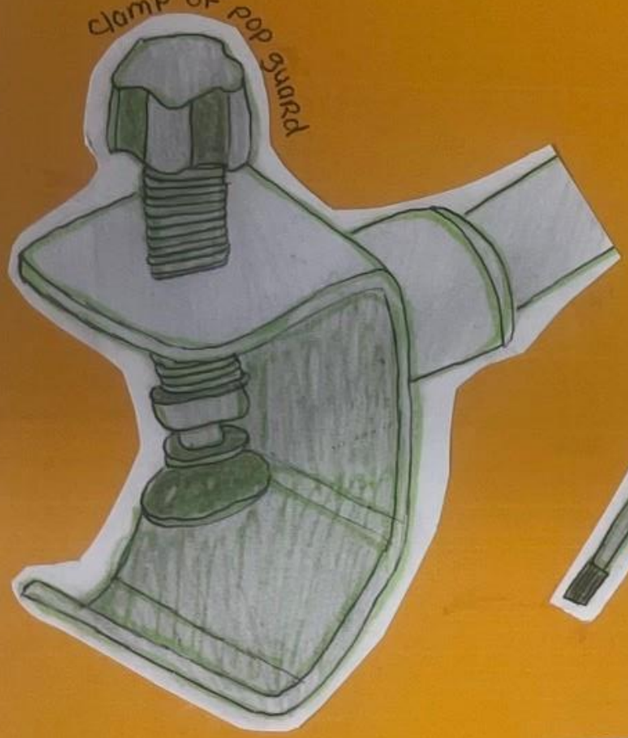
Aesthetic

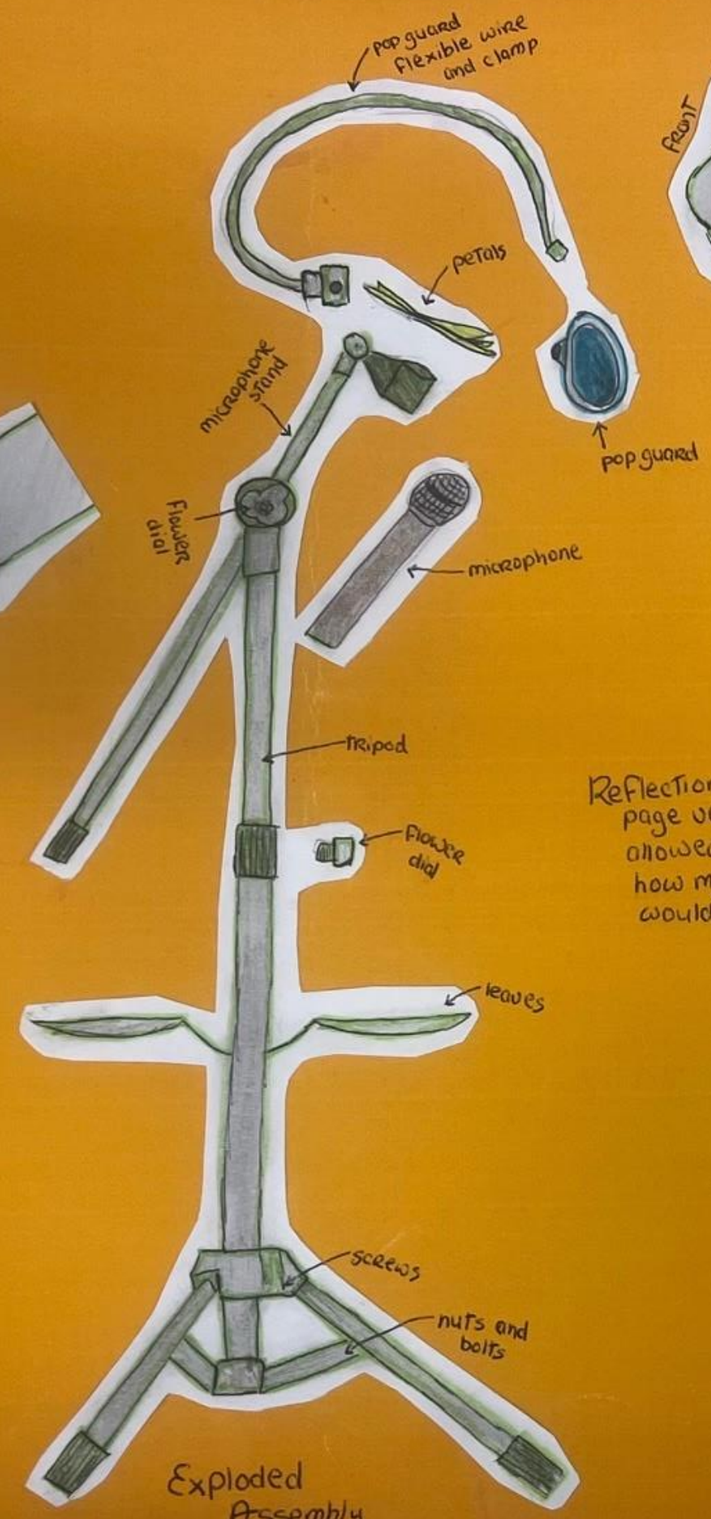
I will add petals around the grill of the mic to replicate a sunflower and make it more aesthetic. I will also add leaves to the tripod and change the dials into the shape of a flower to match the theme. Finally, I will add a pop guard to the mic to improve sound quality with the petals. I believe this will not affect the overall aesthetic however it may affect the view of the person performing.

Functionality

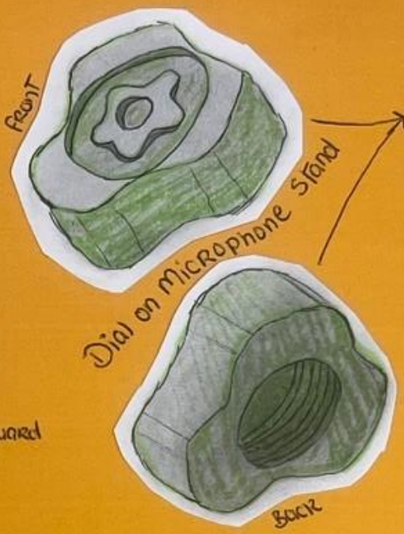
This design may not a functional as an ordinary mic due to the petals. However, it will be more sustainable and aesthetic. And if the stand is adjusted to the correct angle, it will still be possible to sing and perform into the mic.

Output 6 - Presentation of Concept Design





Exploded Assembly

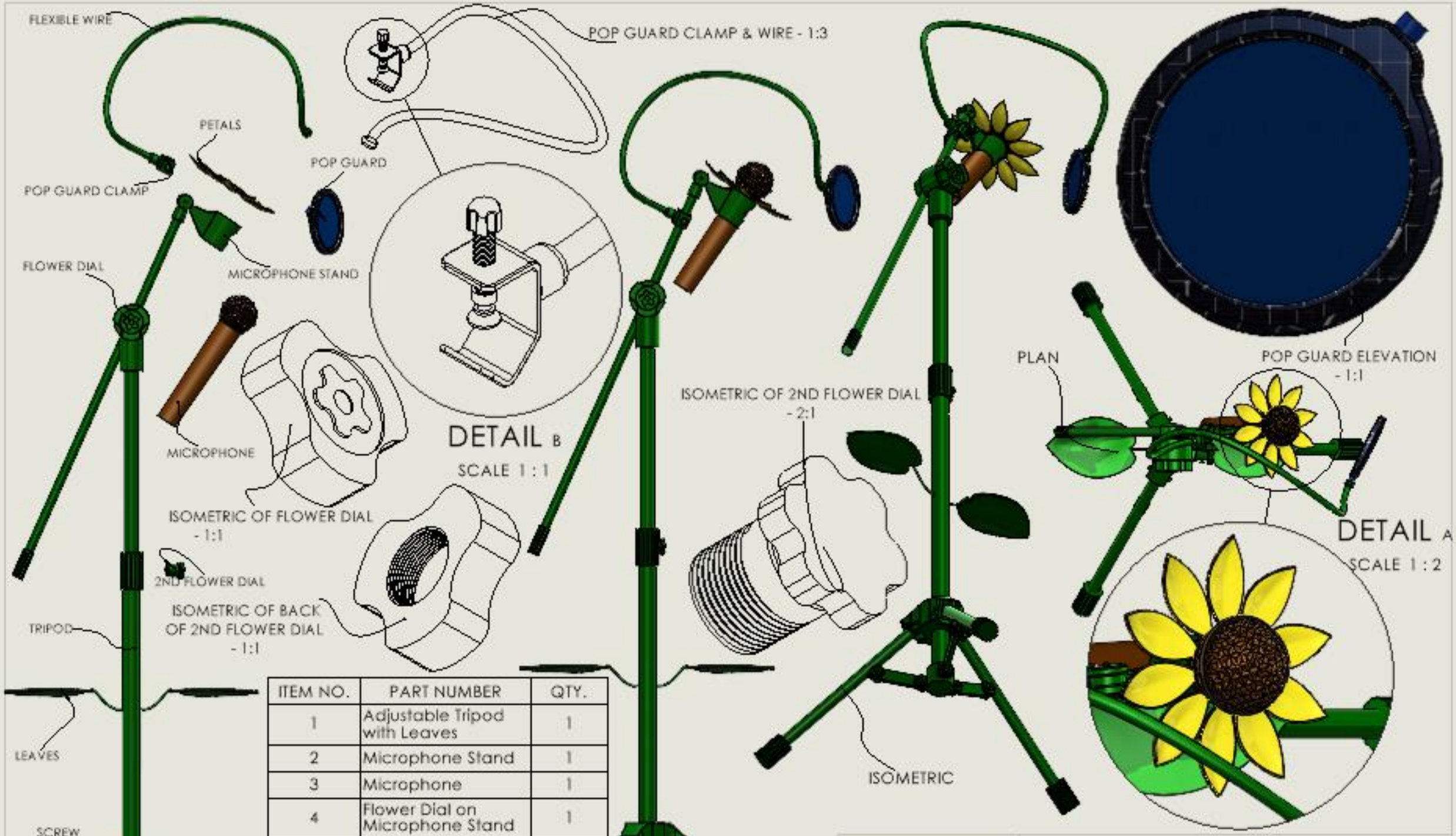


Reflection: I found this page very useful as it allowed me to visualise how my concept design would look on Solid Works

Nut and Bolt

Elevation

Exam Number: 259109



ITEM NO.	PART NUMBER	QTY.
1	Adjustable Tripod with Leaves	1
2	Microphone Stand	1
3	Microphone	1
4	Flower Dial on Microphone Stand	1
5	Flower Dial on the Tripod	1
6	Nuts & Bolts	6
7	Screws	6
8	Petals	
9	Pop Guard Clamp	
[illegible]	Pop Guard	1

TECHNOLOGY SUBJECTS SUPPORT SERVICE

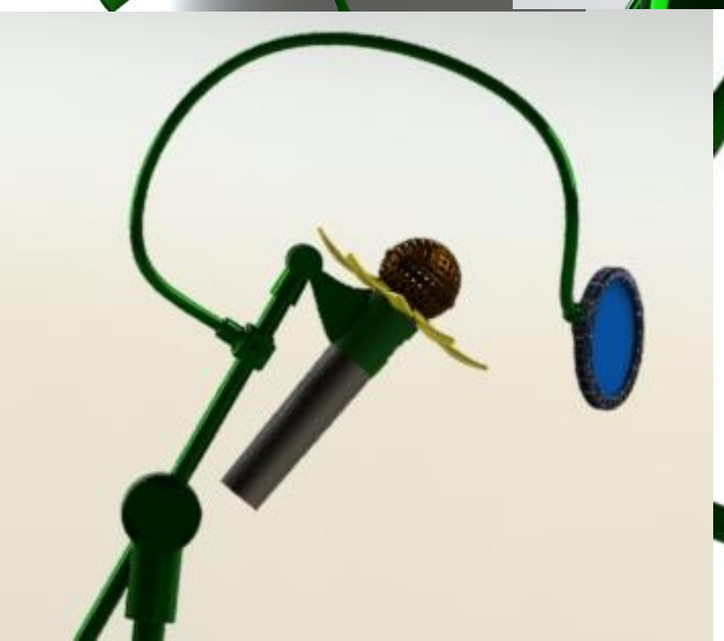
DESIGN & COMMUNICATION GRAPHICS

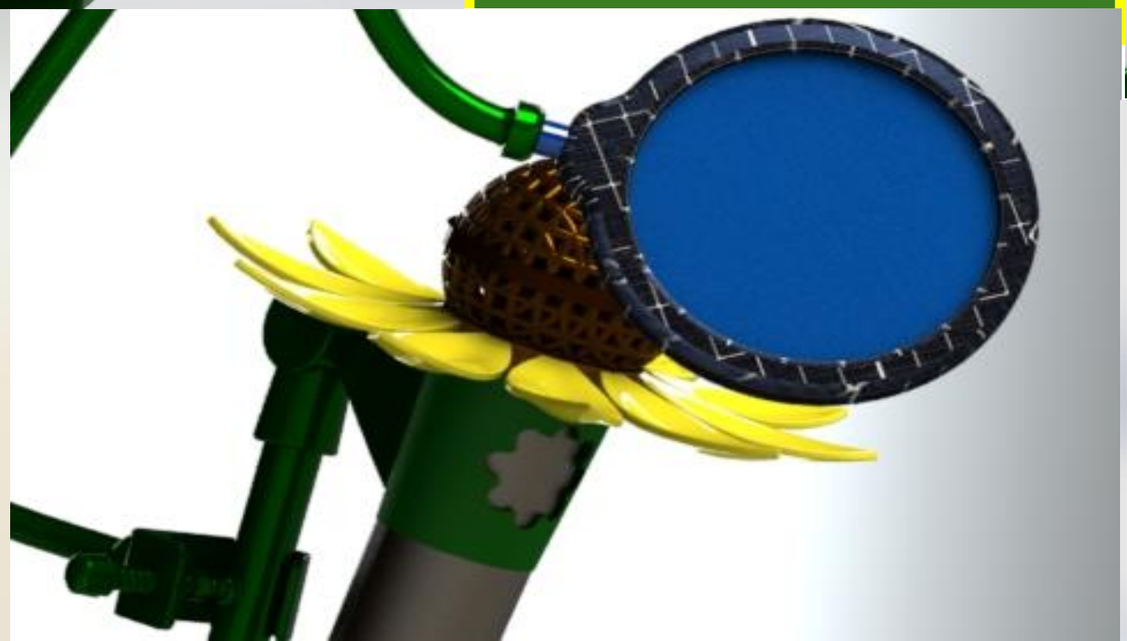
TITLE: Assembly of Concept Microphone

DRAWN BY: YOUR NAME HERE | SIZE A3 | UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN mm

SCALE: 1:5 | DATE: 23/01/2025 | SHEET 1 OF 1

Output 8 - Photorealistic Images





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